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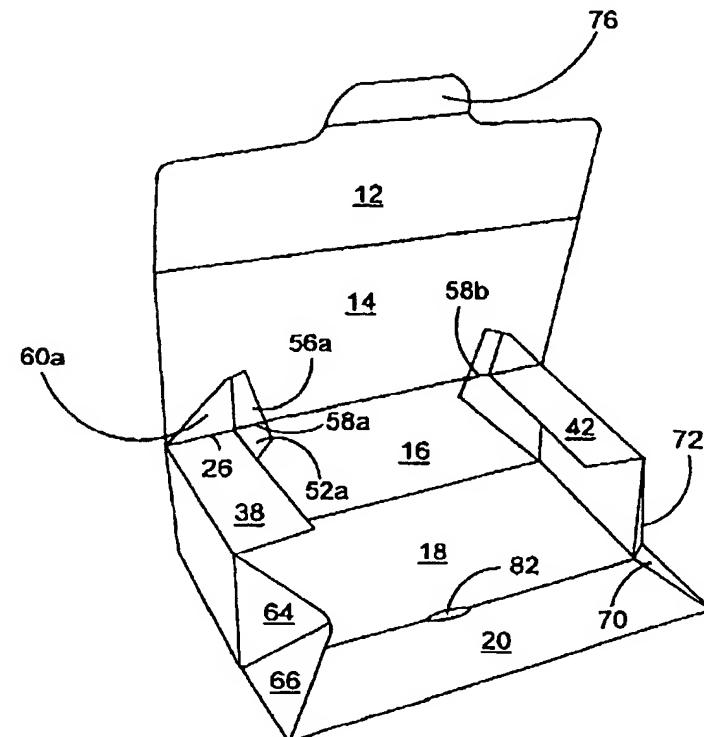
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[Continued on next page]

(54) Title: CARTON AND CARTON BLANK



(57) Abstract: A carton and blank for forming a carton having a first wall panel, a side wall panel and an end wall panel hingedly connected to adjacent edges of the first wall panel and a second wall panel spaced from the first wall panel and hingedly connected to one of the side or end wall panels. There further comprises a corner arrangement having a plurality of web panels hingedly connecting the side and end wall panels in adjacent set up positions and a hinged flap interconnecting the second wall panel to one of the web panels to maintain the side and end walls in said set up positions.

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CARTON AND CARTON BLANK

Background of the Invention

5 The present invention relates to a carton and a carton blank for forming a carton. More particularly, the invention relates to a carton and blank for packaging articles, for example cosmetic products or the like.

10 Cartons for securing cosmetic products are known. It is common for such cartons to be constructed prior to loading. Also, in order to retain the products within the carton, there is commonly provided an internal flange secured to one of the panels so that if the lid of the carton is opened, the products are retained within it.

15 One example of a carton incorporating a flange is illustrated in US 3 008 626 in which there is shown a carton having a top panel that acts as a recloseable lid, opposed side and end walls and a base wall. Flange panels (37, 39) are connected to each end wall and are adapted to be folded inwards to help to retain products contained therein and provide additional support for the lid.

20 In US 2 377 125 the carton is similar to US'626 with the addition of a flange (27) that is connected to a corner structure connecting the side and end wall panels. The side and end wall panels are first constructed by forming the corner structures. Articles are placed within the container and the internal flange is folded inwardly by folding web panels about fold line to be placed intermediate the article and the outer side wall panels. This type of construction
25 . is suited towards hand packing of products, but is not suitable for automated packaging due to the complexity of the folding operation.

The problem with the prior art is that if the carton is constructed and placed in a set up condition prior to loading then it is difficult to place the article(s) in the carton.

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Summary of the Invention

The present invention seeks to overcome or at least mitigate the problems of the prior art.

5 A first aspect of the invention provides a carton having first and second hinged web panels between a side wall and an end wall, wherein the first web panel is disposed in face contacting relationship with the side wall, and the second web panel is provided with a hinged flap, characterised in that the hinged flap and an internal flange foldably extending from one of the side or end walls are hingedly interconnected by a third web panel to retain the internal flange in a folded position with respect to said one of the side or end walls.

10 A second aspect of the invention provides a carton having first and second hinged web panels between a first and a second wall, wherein the first web panel is disposed in face contacting relationship with the first wall, the second web panel is provided with a hinged flap that is in face contacting relationship with a cover panel hinged to the first wall, the hinged flap and an internal flange are hingedly interconnected by a third web panel, and wherein the hinged flap is secured to the cover panel to retain the flange in a horizontal position as well as lock the first and second walls in adjacent abutting positions.

15 A third aspect of the invention provides a carton having a first wall panel, a side wall panel and an end wall panel hingedly connected to adjacent edges of the first wall panel and a second wall panel spaced from the first wall panel and hingedly connected to one of the side or end wall panels wherein there further comprises a corner arrangement having a plurality of web panels hingedly connecting the side and end wall panels in adjacent set up positions and a hinged flap interconnecting the second wall panel to one of the web panels to maintain the side and end walls in said set up positions.

20 A fourth aspect of the invention provides a carton having a base, opposed first and second side walls hingedly connected to the base and first and second end walls hingedly connected to the base and a cover panel. The cover panel is interconnected to an end wall by means of a

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structure that includes a securing panel hinged to the first end wall, which securing panel is secured to the cover panel so that the first end wall is retained in a vertical position.

5 Preferably, the cover panel may be hingedly connected to the first side wall panel and wherein the first side wall panel and first end wall panel are retained in a substantially perpendicular arrangement by the securing panel secured to the cover panel.

10 In one class of embodiments, there may further comprise a first web panel connecting the securing panel to the first side wall. Alternatively, there may further comprise a first web panel connecting the securing panel to the cover panel. Preferably, there may further comprise an aperture so constructed and arranged to allow the securing panel to be placed in direct face contacting arrangement with said cover panel.

15 According to an optional feature of the fourth aspect of the invention the first web panel may be folded to be placed intermediate the securing panel and part of the first side wall panel.

20 According to another optional feature of the fourth aspect of the invention the securing panel may be provided with a fold line that is positioned so as to be juxtaposed the hinged connection between the cover panel and the first side wall panel.

According to another optional feature of the fourth aspect of the invention there may further comprise an internal flange hingedly connected to the first end wall, and a second web panel connecting the internal flange to the securing panel to retain the internal flange in a horizontal folded position.

25 According to a further optional feature of the fourth aspect of the invention there may comprise a bridging panel interconnecting the flange to the base wall.

30 According to a still further optional feature of the fourth aspect of the invention there may further comprise an article securing means provided in the bridging panel. Preferably, the article securing means may comprise a recess formed in the bridging panel. More preferably,

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the recess may be defined by a step panel and tread panel struck from at least part of the bridging panel.

According to yet another optional feature of the fourth aspect of the invention the securing 5 means may comprise a protruding portion struck from the bridging panel.

A fifth aspect of the invention provides a carton having first and second hinged web panels between a first wall and a second wall, wherein the second wall has a hinged horizontal flange. The second web panel is disposed in a vertical bracing position under the flange, and 10 the first web panel is disposed between the second web panel and the first wall to urge the second web panel into the bracing position. Preferably, the second web panel may have a lower edge for abutment on a carton base.

A sixth aspect of the invention provides a reclosable carton having inner and outer lapped 15 wall panel flaps secured together to form a composite carton wall, wherein the inner wall panel has a locking slit, and the outer wall panel has a reusable locking tab folded in flat face contacting relationship with the inside surface of the outer flap and tucked between the inner and outer flaps.

20 A seventh aspect of the invention provides a blank for forming a carton comprising a first side wall panel, a base panel, a second side wall panel and a cover panel hingedly connected together in series and opposed first and second end wall panels hingedly connected to the base panel. There further comprises a securing panel hingedly connected to the first end wall panel which securing panel is adapted to be secured to the cover panel in a set up condition.

25 In one class of embodiments, there may further comprise a first web panel connecting the securing panel to the first side wall. Alternatively, there may further comprise a first web panel connecting the securing panel to the cover panel. Preferably, there may further comprise an aperture so constructed and arranged to allow the securing panel to be placed in 30 direct face contacting arrangement with said cover panel.

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According to an optional feature of the seventh aspect of the invention the securing panel may be provided with a fold line that is positioned so as to be juxtaposed the hinged connection between the cover panel and the first side wall panel in a set up condition.

- 5 According to another optional feature of the seventh aspect of the invention there may further comprise an internal flange hingedly connected to the first end wall, and a second web panel connecting the internal flange to the securing panel to retain the internal flange in a horizontal folded position.
- 10 According to a further optional feature of the seventh aspect of the invention there may further comprise a bridging panel connected to the internal flange panel and adapted to interconnect the flange to the base wall panel in a set up condition. Preferably, there may further comprise a step panel and a tread panel struck from at least part of the bridging panel to form a recess to receive part of an article, in a set up condition.
- 15 An eighth aspect of the invention provides a method of forming a carton from a blank which method comprises the steps of:
 - i) folding the first end panel inwardly towards the base panel and into a substantially perpendicular arrangement;
 - 20 ii) folding the securing panel inwardly;
 - iii) folding the first side wall panel and cover panel inwardly towards the base panel; and
 - iv) securing the securing panel to part of the cover panel to retain the first side wall panel and the first end wall panel in a substantially perpendicular arrangement.
- 25 Preferably, there may further comprise a first web panel connecting the securing panel to the first side wall panel and/or the cover panel and further comprises the step prior to step (ii) of folding the first web panel to be placed intermediate the securing panel and part of the first side wall panel.
- 30 According to an optional feature of the eighth aspect of the invention there may further comprise an internal flange hingedly connected to the first end wall and a second web panel

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connecting the internal flange to the securing panel, which method further comprises the step of folding the internal flange and second web panel inwardly so that the second web panel is placed in face contacting arrangement with the securing panel thereby to retain the internal flange in a substantially horizontal folded position.

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One advantage of the above aspects of the invention is that the carton is part constructed so as to make it easier to load the articles. Furthermore, the part-constructed carton is rigid enough to retain the article(s).

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Brief Description of the Drawings

Exemplary embodiments will now be described, by way of example only, with reference to the accompanying drawings in which:

15 FIGURE 1 is a blank for forming a carton according to a first embodiment of the invention;

FIGURE 2 is a blank for forming a carton according to a second embodiment of the invention;

20 FIGURE 3 is a blank for forming a carton according to a third embodiment of the invention;

FIGURES 4 and 5 illustrate the construction of the carton from the blank of Figure 1;

FIGURES 6 and 7 are a perspective view of the carton in a set up and loaded condition;

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FIGURE 8 illustrates the carton of Figure 7 being re-closed:

FIGURES 9, 10, 11, 12, and 13 illustrate the carton formed from the blank of Figure 2 shown during the various stages of construction;

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FIGURE 14 illustrates the carton shown in Figure 13 being re-closed;

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FIGURES 15 and 16 illustrate the carton formed from the blank of Figure 3 shown fully erected and loaded;

5 FIGURE 17 illustrates the carton of Figure 16 shown being re-closed;

FIGURE 18 is a blank for forming a carton according to a fourth embodiment of the invention;

10 FIGURES 19, 20, 21, 22, 23, 24 and 25 illustrate the carton formed from the blank of Figure 18 shown during the various stages of construction;

FIGURE 26 illustrates the carton shown in Figure 25 being re-closed;

15 FIGURE 27 is a blank for forming a carton according to a fifth embodiment of the invention;

FIGURES 28 and 29 illustrate the carton formed from the blank of Figure 18 shown during the various stages of construction.

20 FIGURES 30 and 31 illustrate the carton of Figure 27 in a set-up condition;

FIGURE 32 is a blank for forming a sixth embodiment of the invention; and

25 FIGURES 33 and 34 illustrate the carton formed from the blank of Figure 32 shown during set-up.

Detailed Description of the Preferred Embodiments

Referring to the drawings, and in particular Figure 1, there is illustrated a blank 10 for
30 forming a carton made from paperboard or similar foldable sheet material and adapted to accommodate one or more articles, for example cosmetic products. The blank 10 comprises a

plurality of panels for forming a carton. In this embodiment, there comprises an outer first side wall panel 12, a top wall panel or cover panel 14, a second side wall panel 16, a base wall panel 18 and an inner first side wall panel 20 hingedly connected together in series along foldlines 22, 24, 26 and 28 respectively. There further comprises opposing end panels 30, 34 5 hingedly connected to opposed end edges of the base panel 18 along fold lines 32 and 36.

A first internal flange panel 38 is provided that is hingedly connected to end panel 30 along foldline 40. There preferably further comprises a second internal flange panel 42 hingedly connected to end panel 34 along foldline 44.

10

In order to assist in maintaining the end panels in a set-up condition, there further comprises a corner arrangement 46a and 46b for connecting end panels 30 and 34 to a second side wall panel 16. In this embodiment the corner arrangement 46a comprises a first and second hinged web panels 50a, 52a hingedly connected together along a foldline 54a. It will be seen from 15 Figure 1 that first web panel 50a is hingedly connected to second side wall panel 16 along an extension of foldline 32. Second web panel 52a is hingedly connected to end wall panel 30 along an extension of foldline 26.

20

The corner arrangement 46a may further comprise a second web arrangement hingedly connected to the second web panel 52a, which, in use, retains internal flange panel in a substantially horizontal folded position. In this embodiment, the corner arrangement 46a comprises a hinged flap 56a and preferably, a third web panel 60a hingedly connected together along fold line 62a. Hinged flap 56a is connected to second web panel 52a along foldline 58a and third web panel 60a is hingedly connected to first internal flange panel 38 25 along an extension of foldline 26.

30

In this embodiment, the foldlines 54a and 62a extend diagonally outwards from the intersection of foldline 26 and foldlines 32 and 40 respectively so that, in use, second web panel 52a and hinged flap are folded to move into co-planar arrangement with side panel 16 and top panel 14 respectively.

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The opposing corner arrangement 46b is substantially the same as corner arrangement 46a with the panels being a mirror image of those panels forming the corner arrangement 46a and is thus not described in any greater detail.

5 In the embodiment of Figure 1, there further comprises a further corner arrangement for securing the inner first sidewall panel 20 to the opposed end wall panels 30, 34. In use, the corner arrangement provides a vertical bracing position under the internal flange panel 38, 42. It will be seen from Figure 1 that the corner arrangement comprises a pair of web panels 64, 66 hingedly connected together along fold line 68. First web panel 64 is hingedly connected to end panel 30 along an extension of fold line 28. Second web panel 66 is secured to inner side wall panel 20 along an extension of fold line 32. Likewise, the opposed corner arrangement comprises web panels 70, 72 hingedly interconnected along fold line 74 and secured to end panel 34 along an extension of fold line 28 and to side panel 20 along an extension of fold line 36 respectively.

10

15 There further comprises means for reclosing the carton. In this embodiment, the reclosing means comprises a releasing tab 76 hingedly connected to outer first side wall panel 12 along fold line 78. A slot formed by cut line 80 is provided for receiving the securing tab 76 on the edge between the inner first side wall panel and base panel 18. There may further comprise 20 an aperture 82, which is used to assist in locating the securing tab 76 to allow it to pass through the slot, described in more detail below. Of course, other known types of reclosing means can be used instead, without departing from the scope of invention.

25

A second embodiment of the invention is illustrated in Figure 2 in which there is a blank 110 for forming a carton for holding articles such as cosmetic products. The blank 110 is similar to the first embodiment illustrated in Figure 1 and the same reference has been used for corresponding parts, with the prefix "1". Therefore, only the differences will be described in any greater detail.

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An aperture A is provided in the cover panel 114 to allow the contents to be viewed.

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The internal flange panels 138, 142 are secured to the base wall 118 by a bridging structure. The bridging structure is connected to the flange panel 138 and comprises a bridging panel 184 hingedly connected to the internal flange panel 138 along fold line 196 and a securing flap 186 hingedly connected to the opposing edge of bridging panel 184 along fold line 192.

5 Likewise, the bridging structure connected to internal flange panel 142 comprises a bridging panel 197 and securing flap 198 hingedly connected together in series to internal flange panel 142 along fold lines 117 and 199.

10 Optionally, there further comprises means for securing an article within the carton. In this embodiment, it is envisaged that the article securing means comprises a recess provided by the bridging panel 184 that is created by the provision of a step arrangement, whereby a riser panel 188 is struck from bridging panel 184 and extends into internal flange panel 138 and is hingedly connected thereto. Riser panel 188 is separated from bridging panel 184 by cut lines 194 and 195. Securing flap 186 extends into bridging panel 184 and is hingedly connected to 15 riser panel 188 along fold line 190. Fold line 190 is spaced but parallel to fold line 192 to form the tread of the step arrangement.

20 The article securing means may further comprise a protruding element and aperture, which is provided by tab 193 and cut line 191 arranged such that tab 193 spans fold line 117. The aperture is formed during construction, described in more detail below.

25 In the second embodiment, a further flange panel 139 is provided to be secured to the outer edge of side wall panel 120 along fold line 141 to improve article retention within the carton and in this embodiment, the web panels 164, 168, 170 and 172 are curved to improve the aesthetic look of the carton, after it has been opened. The other corner arrangements 146a and 146b are substantially similar to the first embodiment and are not therefore further described, as is the reclosure means, although it will be seen from Figure 2 that aperture 182 is larger and a finger tab 111 is provided along fold line 178, described in more detail below.

30 A third embodiment is shown in Figure 3. The blank 210 forms a carton for holding one or more articles, for example cosmetic products and is similar to the first embodiment with like

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parts being designated by the same reference numeral with the prefix "2". Therefore, only the differences will be described in any greater detail.

The corner arrangements for securing the end panels 230 and 234 to inner side wall panel 220 are each provided with a pair of web panels 264, 266 and 272, 270, but in this embodiment, the web panels are hingedly connected together along extensions of fold lines 232 and 236 respectively so that web panels 266 and 270 extend into and are formed from inner side wall panel 220. In use, web panels 264, 272 support the hinged internal flange panels 238, 242 respectively by adopting a vertical brace position, according to one aspect of the invention. Once the carton has been opened, the web panels 264, 272 provide support to the side wall panel 212 to prevent it from being pushed inwardly within the carton, described in more detail below.

The other principal difference of this embodiment relates to the reclosure means whereby, in this embodiment, the securing tab 276 is hingedly connected to inner side wall panel 220 along fold line 278 and outer side wall panel 212 is provided with a protruding portion 275 which functions as a finger tab to allow a user to pull the outer side wall panel 212 away from the inner side wall panel. The slot 280 and aperture 282 are struck along fold line 222.

Turning to the construction of the carton formed from the blanks shown in Figure 1, 2 or 3, it is envisaged that the carton of any aspect of the present invention can be formed by a series of sequential folding and gluing operations in a straight line machine so that the carton is not required to be rotated or inverted to complete its construction. The folding process is not limited to that described below and may be altered according to particular manufacturing requirements.

The construction of the first embodiment will be described with reference to Figures 4, 5, 6, 7 and 8. The first stage is for the corner arrangements 46a and 46b to be constructed. Each corner arrangement is constructed in a like manner and therefore the construction of corner arrangement 46a only will now be described. Second side wall panel 16 and top panel 14 are folded out of alignment with respective base panel 18 along fold lines 26 and 24 respectively.

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End panels 30 and 34 are folded out of alignment with base panel 18 along fold lines 32 and 36 and, in this embodiment, are placed in a substantially perpendicular arrangement with respect to base panel 18. The corner arrangement 46a is constructed by folding first web panel 50 in an inward direction along fold line 32 so as to be placed in face contacting arrangement with second side wall panel 16. This folding action causes second web panel 52a to be folded along fold line 54a so that second web panel 52a comes into contact with first web panel 50a. At the same time, in those embodiments with a third web panel 60a, it is pulled in an inward direction so as to be folded out of alignment with hinged flap 56a along fold line 62a to cause the flange 38 to be folded inwardly about fold line 40. Thus, the carton 10 is at an intermediate stage of construction as shown in Figure 4.

The corner arrangement 46a is completed by continuing to fold second side wall panel 60 along fold line 26 into a substantially perpendicular arrangement with base panel 18 so that first web panel 50a is in a face contacting arrangement with side wall panel 16 and second web panel 52a is placed in a face contacting arrangement with the opposing surface of web panel 50a. This folding action automatically results in hinged flap 56a being placed in face contacting arrangement with top panel 14. Preferably, hinged flap 56a is secured thereto by glue or other suitable means known in the art. Of course, in other embodiments, the hinged flap 56a is not secured to the top panel 14, and can be used to support the top panel only.

20

The corner arrangement 46b is folded in like manner, so that the carton is at the stage of construction shown in Figure 5. It will be seen that fold lines 58a, 58b and the extensions of fold line 26 are aligned with fold line 24.

25

At this stage of the construction, the inner flange panels 38 and 42 are held in a substantially perpendicular arrangement with side wall panels 30 and 34 respectively because hinged flap 56a is, preferably, secured to top wall panel 14. Of course, it is envisaged that the first and/or second web panels 50a, 52a can be secured to the adjacent walls of the carton to produce the same effect, without departing from the scope of invention.

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In one class of embodiments, the third web panels 60a and 60b function as "over centre" panels, whereby there is a degree of resistance to prevent the flange panels 38 and 42 from being displaced out of a horizontal plane. However, if a user applies sufficient force to these panels in an outward direction then the web panels 60a, 60b fold outwards along fold lines 26 and 62a so that the inner flange panels would "pop up" automatically to gain access to the interior. In other embodiments, the web panels 60a, 60b are secured to the hinged flap 56a, 56b that may or may not be secured to the cover panel 14.

Articles are inserted into the carton by hand or automated packaging machinery.

10

In order to complete construction the inner first side wall panel 20 is folded inwardly along fold lines 28 and corner web panels 64, 66 and 70, 72 are likewise folded inwardly along fold lines 68 and 74 respectively, as shown in Figure 5, so that the inner first side wall panel 20 is folded into a substantially perpendicular arrangement with respective base wall panel 18.

15

Thereafter, the top wall panel 14 is folded inwardly to come into abutment with the inner flange panels 38, 42 and outer first side wall panel 12 is folded along fold line 22 into face contacting arrangement with inner side wall panel 20. Securing tab 76 is folded along fold line 78 to be secured to the exterior surface of base wall panel 18 so as to complete the 20 construction of the carton shown in Figures 6 and 7.

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In order to gain access to the interior of the carton, securing tab 76 is pulled outwardly away from base panel 18 to be separated therewith which causes the outer side wall panel 12 to be folded outwardly away from inner side wall panel 20. The carton can be accessed by opening out the top panel 14 and/or the inner side wall panel 20 in a manner similar to that shown in Figure 5. In order to reclose the carton, the securing tab 76 is pushed into the preformed slot 80 as shown in Figure 8. The aperture 82 allows a user to grip tabs 76 to re-open the carton.

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Turning to the construction of the second embodiment of Figure 2, reference is now made to Figures 9, 10, 11, 12, 13 and 14.

5 The first stage of forming the carton of the second embodiment from the blank 110 is to form the article securing means. This is achieved by folding the inner flange panels 138 and 142 inwardly along fold lines 140 and 144 respectively so as to bring the inner flange panels 138, 142 and bridge panels 184, 186, 197, 198 for forming the bridging structure into face contacting arrangement with the respective side wall panels 130 and 134 and base wall panel 118. Securing panels 186 and 198 are secured to base wall panel 118 by glue G or other 10 suitable means known in the art. Thus, the carton is in a part constructed form but in a flat collapsed condition as shown in Figure 10.

In order to construct the corner arrangements 146a, 146b the side walls 130, 134 are first 15 folded out of alignment with base wall panels along fold lines 132, 136 which action causes the internal flange panels 138, 142 to be folded out of face contacting arrangement with the respective side wall panels 130, 134 and placed into substantially perpendicular relationship shown in Figure 11. The article securing means is automatically deployed. It will be seen from Figure 11 that the step panel 188 is spaced from bridging panel 184 by the extension of securing flap 186 to define a recess for receiving part of an article to be stored therein. The 20 opposing bridging panel is likewise folded out of alignment with inner flange panel 142 to reveal an aperture formed by the cut line 199 and the protruding portion 193 so that the opposing end of an article is retained by it.

In this embodiment, there is only one article securing means although it is envisaged that two 25 or more can be included without departing from the scope of invention.

The corner arrangements 146a, 146b are constructed in like manner to the first embodiment and therefore the construction of corner arrangement 146a only will now be described. Second side wall panel 116 and top panel 114 are folded out of alignment with respective 30 base panel 18 along fold lines 124 and 126 respectively. The corner arrangement 146a is constructed by folding first web panel 150a in an inward direction along fold line 132 so as to

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be placed in face contacting arrangement with second side wall panel 116. This folding action causes second web panel 152a to be folded along fold line 154a so that second web panel 152a comes into contact with first web panel 150a. At the same time, third web panel 60a is folded out of alignment with hinged flap 156a along fold line 162a in an inward direction to cause the flange 138 to be folded inwardly about fold line 140. Hinged flap 156 and/or third web panel 160a is, optionally, secured to cover panel 114. Of course in other embodiments, the hinged flap 156 and/or third web panel 160a is not secured to the cover panel. Thus the carton is at an intermediate stage of construction shown in Figure 11.

10 One or more articles are inserted into the carton, and/or article securing means by hand or automated packaging machinery.

In order to complete construction of the carton shown in Figures 12 and 13, the inner side wall panel 20 and corner panels 164, 166, 170, 172 are folded inwardly in a similar manner to 15 the first embodiment shown in Figure 5 so that the inner side wall panel is placed in substantially perpendicular relationship with respect to base panel 118 and flange panel 139 is folded inwardly to come in to abut the inner flange panels 138 and 142. Finally, the top panel 114 is folded over the carton to be secured in place.

20 In this embodiment the reclosing means provided by reclosing tab 176 that is folded inwardly to come into face contacting relationship with outer side wall panel 112 which in turn is folded into abutment with inner side wall panel and is secured thereto by glue G or other suitable means known in the art, as shown in Figure 12. In order to release the outer first wall panel 112 from the inner first wall panel 120, a finger tab 178 is provided as shown in Figure 25 13. The carton is opened to allow access to the interior of the carton to remove an article. In order to reclose the carton, reclosing tab 176 is folded outwardly away from outer first side wall panel 112 so as to be pushed into the preformed slot 180 shown in Figure 14.

Beneficially, the carton of the second embodiment provides a reclosure arrangement, which is 30 hidden from view until after the carton is opened thereby to provide a more aesthetically pleasing appearance to the outer carton.

5 The construction of the third embodiment is substantially the same as the first embodiment in that the corner arrangements 246a and 246b are first constructed in identical fashion so that the construction corresponds to that shown in Figures 4 and 5. Articles are then inserted into the carton by hand or automated packaging machinery.

10 In order to complete construction the inner first side wall panel 220 is folded inwardly along fold lines 228 and corner web panels 264, 266 and 270, 272 are likewise folded inwardly along fold lines 268 and 274 respectively, as shown in Figure 15, so that the inner first side wall panel 220 is folded into a substantially perpendicular arrangement with respective base wall panel 218. The web panels 264 and 272 are positioned so as to abut the underside of the inner flanges 238, 272 and the base wall 218 thereby to improve the rigidity of the carton.

15 Thereafter, the top wall panel 214 is folded inwardly to come into abutment with the inner flange panels 238, 242 and outer first side wall panel 212 is folded along fold line 222 into face contacting arrangement with inner side wall panel 220. Securing tab 276 is folded along fold line 278 to be secured to the exterior surface of base wall panel 218 so as to complete the construction of the carton shown in Figures 15 and 16.

20 In order to gain access to the interior of the carton, securing tab 276 is pulled outwardly away from base panel 218 to be separated therewith which causes the outer side wall panel 212 to be folded outwardly away from inner side wall panel 220. The carton can be accessed by opening out the top panel 214 and/or the inner side wall panel 220 in a manner similar to that shown in Figure 5. In order to reclose the carton, the securing tab 276 is pushed into the preformed slot 280 as shown in Figure 17. The aperture 282 allows a user to grip tabs 276 to re-open the carton.

30 A fourth embodiment is illustrated in Figures 18 to 23 in which many of the parts are identical to the first and second embodiments and therefore the like parts have been designated by the same reference numeral with the prefix "3". Therefore only the differences will be described in any greater detail. Thus, there is provided corner arrangements 346a and

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346b, article securing means provided by bridging panel 384 and 386 and protruding portion 393 and cut lines 391. There further comprises an additional flange 339 secured to first side wall panel 320 along fold line 341.

5 A first internal flange panel 338 is provided that is hingedly connected to end panel 330 along foldline 340. Similarly a second internal flange panel 342 is hingedly connected to end panel 334 along foldline 344.

In order to assist in maintaining the end panels and/or side panels in a set-up condition, there
10 further comprises a corner arrangement 346a and 346b for connecting end panels 330 and 334 to the cover panel 314. In this embodiment the corner arrangement 346a comprises a securing panel 352a/356a connected to end wall panel 330 along an extension of fold line 326. In this embodiment, the securing panel 352a is provided with a fold line to define a second part 356a. This fold line is optionally an extension of fold line 340.

15 Preferably, there further comprises a first web panel 350a, that in this embodiment is hingedly connected to top wall panel 314 along interrupted foldline 332. Of course, in other embodiments, first web panel 350a may be connected to side wall panel 316. It will be seen from Figure 18 that securing panel 352a is connected to first web panel 350a along fold line 20 354a.

The corner arrangement 346a may further comprise a second web arrangement hingedly connected to the securing panel 352a, which, in use, retains internal flange panel 338 in a substantially horizontal folded position. In this embodiment, the corner arrangement 346a
25 comprises a second web panel 360a hingedly connected to securing panel 352a along fold line 362a and second web panel 360a is hingedly connected to first internal flange panel 338 along an extension of foldline 326.

In this embodiment, the foldline 362a extends diagonally outwards from the intersection of
30 foldline 326 and foldline 340 respectively so that, in use, second web panel 352a and part of

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the securing panel are folded into overlapping arrangement and in face contacting relationship with cover panel 314.

5 Preferably, an aperture 359, 357 is struck from part of the first web panel 350a to reduce the amount of board that overlaps with the securing panel 352a to make it easier to fold the corner arrangement. The apertures 359, 357 also allow the securing panel 352a, 356a, to be placed in direct face contacting arrangement with cover panel 314 to be secured thereto. Therefore, the corner arrangements 346a, 346b are adapted to connect the cover panel 314 to the end panel 330.

10

The opposing corner arrangement 346b is substantially the same as corner arrangement 346a with the panels being a mirror image of those panels forming the corner arrangement 346a and is thus not described in any greater detail.

15

Preferably, there further comprises a further corner arrangement for securing the inner first sidewall panel 320 to the opposed end wall panels 330, 334. In use, the corner arrangement provides a vertical bracing position under the internal flange panel 338, 342. It will be seen from Figure 18 that the corner arrangement comprises a pair of web panels 364, 366 hingedly connected together along fold line 368. First web panel 364 is hingedly connected to end panel 330 along an extension of fold line 328. Second web panel 366 is secured to inner side wall panel 320 along an extension of fold line 332. Likewise, the opposed corner arrangement comprises web panels 370, 372 hingedly interconnected along fold line 374 and secured to end panel 334 along an extension of fold line 328 and to side panel 320 along an extension of fold line 336 respectively.

20

25 The corner panels 364, 372 are, optionally, provided with apertures 353, 355 for ease of folding. There further comprise apertures 351 struck from side wall panel 320. In use, web panels 366 and 374 are folded inwardly to abut inner surfaces of the inner first side wall panel so that the outer first side wall panel can be secured directly on to the web panels 360 and 370 through aperture 351 by glue or other suitable means known in the art in order to provide a more rigid structure. The corner panels 366, 370 may provide a vertical brace.

An aperture A is provided in the cover panel 314 to allow the contents to be viewed.

5 The internal flange panels 338, 342 are secured to the base wall 318 by a bridging structure, in this embodiment. The bridging structure connected to the panel 338 comprises a bridging panel 384 hingedly connected to the internal flange panel 338 along fold line 396 and a securing flap 386 hingedly connected to the opposing edge of bridging panel 384 along fold line 392. Likewise, the bridging structure connected to internal flange panel 342 comprises a bridging panel 397 and securing flap 398 hingedly connected together in series to internal flange panel 342 along fold lines 317 and 399.

10

A further flange panel 339 may be provided to be secured to the outer edge of side wall panel 320 along fold line 341 to improve article retention within the carton and in this embodiment.

15 In use, the additional flange 339 helps to maintain the carton in a set up condition by placement in fact contacting arrangement with internal flange panels 338 and 342. The web panels 364, 368, 370 and 372 are curved to improve the aesthetic look of the carton, after it has been opened.

20 The construction of the carton will be described by reference to Figures 19 to 25: the first stage of forming the embodiment from the blank 310 is to form the article securing means. This is achieved by folding the inner flange panels 338 and 342 inwardly along fold lines 340 and 344 respectively so as to bring the inner flange panels 338, 342 and bridge panels 384, 386, 397, 398 for forming the bridging structure into face contacting arrangement with the respective side wall panels 330 and 334 and base wall panel 318. Securing panels 386 and 398 are secured to base wall panel 318 by glue G or other suitable means known in the art. Thus, the carton is in a part constructed form but in a flat collapsed condition as shown in Figure 20.

25

30 In order to construct the corner arrangements 346a, 346b the end walls 330, 334 are first folded out of alignment with base wall panels along fold lines 332, 336, which action causes the internal flange panels 338, 342 to be folded out of face contacting arrangement with the

- 20 -

respective end wall panels 330, 334 and to be placed into substantially perpendicular relationship thereby automatically deploying article securing means. It will be seen from Figure 21 that the step panel 388 is spaced from bridging panel 384 by the extension of securing flap 386 to define a recess for receiving part of an article stored therein. The 5 opposing bridging panel is likewise folded out of alignment with inner flange panel 342 to reveal an aperture formed by the cut line 391 and being separated from the protruding portion 393 as the opposing end of an article is retained in place by the protruding portion 393.

10 The corner arrangements 346a, 346b are constructed in a like manner and therefore the construction of corner arrangement 346a only will now be described. First web panel 350a is caused to be folded along fold line 332 when end wall panel 330 is constructed as shown in Figure 21. Second side wall panel 316 and top panel 314 are folded out of alignment with respective base panel 318 along fold line 326. The first web panel 350a continues to be folded inwardly and into face contact with top panel 314, which folds securing panel 352a out 15 of alignment as shown in Figure 22. First web panel 350a can be secured to top panel 314 by glue or other suitable means known in the art, although this is optional and still within the scope of invention.

20 This folding action causes securing panel 352a/356a to be folded along fold line 354a so that it comes into contact with part of cover panel 314. In this embodiment, upper part 356a of securing panel is folded out of alignment with second web panel 360a along fold line 362a in an inward direction to be placed intermediate second web panel 360a and cover panel 314 to be secured thereto. Thus the carton is at an intermediate stage of construction shown in Figure 23 and is ready to be loaded with one or more articles. The carton is part set up and is 25 in rigid condition so that any articles are retained by the article securing means.

In order to complete construction of the carton shown in Figures 24 and 25, the cover panel 314 and second side panel 316 continue to be folded inwardly so that the second web panel 360a comes into abutment with internal flange. Finally, the inner side wall panel 320 and 30 corner panels 364, 366, 370, 372 are folded inwardly, shown in Figure 23, and inner side wall panel 320 is placed in substantially perpendicular relationship with respect to base panel 318.

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Flange panel 339 is folded inwardly to come in to abut the inner flange panels 338 and 342. The cover panel 314 is folded over the carton and outer side wall panel 312 comes into face contacting arrangement with inner side wall panel 320.

5 In this embodiment, the reclosing means provided by tab 376 is folded inwardly to come into face contacting relationship with base panel 318 and is secured thereto by glue G or other suitable means known in the art, as shown in Figure 24 and 25. Alternatively, securing flap 376 is folded to be placed intermediate inner and outer side wall panels 320, 312 and outer side wall panel is secured to corner panels 366 and 370 by glue or other means known in the art through apertures 351.

10

In order to release the outer first wall panel 312 from the inner first wall panel 320, a finger tab 398 is provided as shown in Figure 26. The carton is opened to allow access to the interior of the carton to remove an article. In order to reclose the carton, reclosing tab 376 is 15 folded outwardly away from outer first side wall panel 312 so as to be pushed into the preformed slot 380 shown in Figure 26.

The fifth embodiment is illustrated in Figures 27 to 31. The blank 410 forms a carton for holding one or more articles, for example cosmetic products and is similar to the first 20 embodiment with like parts being designated by the same reference numeral with the prefix "4". Therefore, only the differences will be described in any greater detail.

The corner arrangement is similar to the arrangement of the first embodiment, although the first web panel 450a is reduced in size towards its free edge and second hinged panel 452a 25 protrudes outwardly beyond the first web panel 450a, as shown in Figure 27. In some embodiments, the protrusion provides an area to secure the second web panel 452a to the side wall panel 416, for example glue or other suitable means known in the art.

The other main feature of this blank is that the top and bottom of the carton have been 30 swapped over, so that the top wall is provided by top panel 418 and the base is formed from

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base panels 414 and 476 that are secured together in a set up carton described in more detail below. The top and base panels have been interchanged but otherwise the relationship with the other panels remains unchanged.

5 There further comprises a cover panel 479 frangibly connected to top panel 418 and optionally a pull tab 481. In use, a user pulls the pull tab 481 to remove the cover panel 479 from the carton in order to gain access to the interior of the carton.

10 The construction of the fifth embodiment is substantially the same as the first embodiment in that the corner arrangements are first constructed in identical fashion so that the construction corresponds to that shown in Figures 4 and 5. Articles are then inserted into the carton by hand or automated packaging machinery. Thus, the

15 Second side wall panel 416 and base panel 414 are folded out of alignment with respective top panel 418 along fold lines 426 and 424 respectively. End panels 430 and 434 are folded out of alignment with top panel 418 along fold lines 432 and 436 and, in this embodiment, are placed in a substantially perpendicular arrangement with respect to top panel 418. The corner arrangement is constructed by folding first web panel 450a in an inward direction along fold line 432 so as to be placed in face contacting arrangement with second side wall panel 416.

20 This folding action causes second web panel 452a to be folded along fold line 454a so that second web panel 452a comes into contact with first web panel 450a. Preferably, the protruding part of second web panel 452a abuts the side wall panel 416 to be secured thereto. At the same time, in those embodiments with a third web panel 460a, it is pulled in an inward direction so as to be folded out of alignment with hinged flap 456a along fold line 25 462a to cause the flange 438 to be folded inwardly about fold line 440. Thus, the carton is at an intermediate stage of construction as shown in Figure 28.

30 As shown in Figure 28 and 29, the corner arrangement is completed by continuing to fold second side wall panel 460 along fold line 426 into a substantially perpendicular arrangement with top panel 418 so that first web panel 450a is in a face contacting arrangement with side wall panel 416 and second web panel 452a is placed in a face contacting arrangement with the

- 23 -

opposing surface of web panel 450a, and side wall panel 416. This folding action automatically results in hinged flap 456a being placed in face contacting arrangement with base panel 14, and optionally base panel 476. Preferably, hinged flap 456a is secured thereto by glue or other suitable means known in the art. Of course, in other embodiments, the 5 hinged flap 456a is not secured to the base panel 414, and can be used to support the base wall only.

In order to complete construction the second side wall panel 420 is folded inwardly along fold lines 428 and corner web panels 464, 466 and 470, 472 are likewise folded inwardly along 10 fold lines 468 and 474 respectively, so that the side wall panel 420 is folded into a substantially perpendicular arrangement with respective top wall panel 418. The web panels 464 and 472 are positioned so as to abut the underside of the inner flanges 438, 472 and the top wall 418 thereby to improve the rigidity of the carton.

15 Thereafter, the base wall panels 414 and 476 are folded inwardly to come into abutment with the inner flange panels 438, 442 to be secured together so as to complete the construction of the carton shown in Figures 30 and 31.

20 The sixth embodiment is illustrated in Figures 32 to 34. The blank 510 forms a carton for holding one or more articles, for example cosmetic products and is similar to the first embodiment with like parts being designated by the same reference numeral with the prefix "5". Therefore, only the differences will be described in any greater detail

25 In this embodiment the corner arrangement comprises a first and second hinged web panels 550a, 552a hingedly connected together along a foldline 554a. It will be seen from Figure 32 that first web panel 550a is hingedly connected to first side wall panel 516 along an extension of foldline 532. Second web panel 552a is hingedly connected to end wall panel 530 along an extension of foldline 526. Optionally, the extended fold line deviates from the notional path of fold line 526, to provide a shaped corner in a set up carton.

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The corner arrangement may further comprise a second web arrangement hingedly connected to the second web panel 552a, which, in use, retains cover panel 514 in a substantially horizontal folded position. In this embodiment, the corner arrangement comprises a hinged flap 556a connected to second web panel 552a along foldline 558a. In use, the hinged flap 5 556a is, preferably secured to the top panel 514 so as to maintain it in a horizontal position.

The construction of the corner arrangement is similar to the first embodiment and as illustrated in Figure 33.

10 In order to complete construction the side wall panels 514, 520 are folded inwardly along fold lines 526 and 528, so that the side wall panel 520 is folded into a substantially perpendicular arrangement with respective base wall panel 518. The web panels 556 are positioned so as to abut the underside of the top wall panels 514, 576 thereby to improve the rigidity of the carton. The securing flaps 515, 577 are inserted into corresponding slots 544 formed in the 15 flanges 538 to complete construction of the carton, as shown in Figure 34.

It will be recognised that as used herein, directional references such as "top", "base", "end", "side", "inner", "outer" and "cover" do not limit the respective panels to such orientation, but merely serve to distinguish these panels from one another. Any reference to hinged connection 20 should not be construed as necessarily referring to a single fold line only: indeed it is envisaged that hinged connection can be formed from one or more of one of the following, a score line, a frangible line or a fold line, without departing from the scope of invention.

It is envisaged that any of the features, for example the reclosure means, corner arrangements 25 64, 66, 70, 72, article securing means, corner arrangements of the different embodiments are interchangeable so that any one or more of these features can be added to or replace existing features of the embodiments, without departing from the scope of invention.

It should be understood that various changes may be made within the scope of the present 30 invention, for example, the size and shape of the panels and apertures may be adjusted to

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accommodate articles of differing size or shape, alternative top and base closure structures may be used. The carton may accommodate more than one article in different arrays.

The present invention and its preferred embodiments relates to a corner arrangement in a
5 carton and is shaped to provide satisfactory strength in a set up position but with a degree of flexibility so that the load transferred to the panels is absorbed by the carrier. The shape of the blank minimises the amount of paperboard required. The carrier can be formed by hand or machinery. It is anticipated that the invention can be applied to a variety of carriers not limited to those of the type disclosed herein.

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CLAIMS

1. A carton having first and second hinged web panels between a side wall and an end wall, wherein the first web panel is disposed in face contacting relationship with the side wall, and the second web panel is provided with a hinged flap, characterised in that the hinged flap and an internal flange foldably extending from one of the side or end walls are hingedly interconnected by a third web panel to retain the internal flange in a folded position with respect to said one of the side or end walls.
- 10 2. A carton having first and second hinged web panels between a first and a second wall, wherein the first web panel is disposed in face contacting relationship with the first wall, the second web panel is provided with a hinged flap that is in face contacting relationship with a cover panel hinged to the first wall, the hinged flap and an internal flange are hingedly interconnected by a third web panel, and wherein the hinged flap is secured to the cover panel to retain the flange in a horizontal position as well as lock the first and second walls in adjacent abutting positions.
- 20 3. A carton having a first wall panel, a side wall panel and an end wall panel hingedly connected to adjacent edges of the first wall panel and a second wall panel spaced from the first wall panel and hingedly connected to one of the side or end wall panels wherein there further comprises a corner arrangement having a plurality of web panels hingedly connecting the side and end wall panels in adjacent set up positions and a hinged flap interconnecting the second wall panel to one of the web panels to maintain the side and end walls in said set up positions.
- 25 4. A carton as claimed in claim 3 wherein the second wall panel is secured to the hinged flap to maintain the side and end walls in said set up positions.
5. A carton as claimed in claim 4 wherein the second wall panel is a cover flap.

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6. A carton as claimed in claim 3 wherein the that the hinged flap and the second wall panel are hingedly interconnected by a further web panel to retain the second wall panel in a folded position with respect to said one of the side or end walls.

5 7. A carton as claimed in claim 6, wherein the second wall panel is an internal flange hingedly interconnected by a hinged flap to retain the internal flange in a horizontal folded position.

10 8. A carton having first and second hinged web panels between a first wall and a second wall, wherein the second wall has a hinged horizontal flange, the second web panel is disposed in a vertical bracing position under the flange, and the first web panel is disposed between the second web panel and the first wall to urge the second web panel into the bracing position.

15 9. A carton as claimed in claim 8 wherein the second web panel has a lower edge for abutment on a carton base.

10. A carton having a base, opposed side and end walls and a cover panel, wherein the cover panel is interconnected to an end wall by means of a structure that includes a securing 20 panel hinged to the cover panel so that the end wall is retained in a vertical position.

11. A carton as claimed in claim 10, wherein the securing panel and a first web panel is provided with a hinged flap secured to a cover panel, characterised in that the hinged flap and an internal flange are hingedly interconnected by a hinged flap to retain the internal flange in 25 a horizontal folded position.

12. A carton as claimed in claim 11 wherein there comprises a bridging panel interconnecting the internal flange to the base.

30 13. A carton as claimed in claim 12 wherein there further comprises an article securing means provided in the bridging panel.

14. A carton as claimed in claim 13 wherein the article securing means comprises a recess formed in the bridging panel.

5 15. A carton as claimed in claim 14 wherein the recess is defined by a step panel and tread panel struck from at least part of the bridging panel.

10 17. A carton having first and second hinged web panels between a first wall and a second wall, wherein the second wall has a hinged horizontal flange, the second web panel is disposed in a vertical bracing position under the flange, and the first web panel is disposed between the second web panel and the first wall to urge the second web panel into the bracing position.

15 18. A carton as claimed in claim 14 wherein the second web panel has a lower edge for abutment on a carton base.

19. A reclosable carton having inner and outer lapped wall panel flaps secured together to form a composite carton wall, wherein the inner wall panel has a locking slit, and the outer wall panel has a reusable locking tab folded in flat face contacting relationship with the inside surface of the outer flap and tucked between the inner and outer flaps.

20 20. A carton having a base, opposed first and second side walls hingedly connected to the base and first and second end walls hingedly connected to the base and a cover panel wherein the cover panel is interconnected to an end wall by means of a structure that includes a securing panel hinged to the first end wall, which securing panel is secured to the cover panel so that the first end wall is retained in a vertical position.

25 21. A carton as claimed in claim 20 wherein the cover panel is hingedly connected to the first side wall panel and wherein the first side wall panel and first end wall panel are retained in a substantially perpendicular arrangement by the securing panel secured to the cover panel.

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22. A carton as claimed in claim 21 wherein there further comprises a first web panel connecting the securing panel to the first side wall.

23. A carton as claimed in claim 21 wherein there further comprises a first web panel connecting the securing panel to the cover panel.

24. A carton as claimed in claim 23 further comprising an aperture so constructed and arranged to allow the securing panel to be placed in direct face contacting arrangement with said cover panel.

10

25. A carton as claimed in any of claims 22 to 24 wherein the first web panel is folded to be placed intermediate the securing panel and part of the first side wall panel.

15

26. A blank for forming a carton comprising a first side wall panel, a base panel, a second side wall panel and a cover panel hingedly connected together in series and opposed first and second end wall panels hingedly connected to the base panel wherein there further comprises a securing panel hingedly connected to the first end wall panel which securing panel is adapted to be secured to the cover panel in a set up condition.

20

27. A blank as claimed in claim 26 wherein there further comprises a first web panel connecting the securing panel to the first side wall.

28. A blank as claimed in claim 26 wherein there further comprises a first web panel connecting the securing panel to the cover panel.

25

29. A blank as claimed in claim 28 further comprising an aperture so constructed and arranged to allow the securing panel to be placed in direct face contacting arrangement with said cover panel.

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30. A blank as claimed in any of claims 27 to 29 wherein the securing panel is provided with a fold line that is positioned so as to be juxtaposed the hinged connection between the cover panel and the first side wall panel in a set up condition.

5 31. A blank as claimed in any of claims 26 to 30 claim wherein there further comprises an internal flange hingedly connected to the first end wall, and a second web panel connecting the internal flange to the securing panel to retain the internal flange in a horizontal folded position.

10 32. A blank according to any of claims 26 to 31 wherein there further comprises a bridging panel connected to the internal flange panel and adapted to interconnect the flange to the base wall panel in a set up condition.

15 33. A blank as claimed in claim 32 wherein there further comprises a step panel and a tread panel struck from at least part of the bridging panel to form a recess to receive part of an article, in a set up condition.

34. A method of forming a carton from a blank as claimed in any of claims 26 to 33 which method comprises the steps of:

20 i) folding the first end panel inwardly towards the base panel and into a substantially perpendicular arrangement;

ii) folding the securing panel inwardly;

iii) folding the first side wall panel and cover panel inwardly towards the base panel; and

iv) securing the securing panel to part of the cover panel to retain the first side wall panel

25 and the first end wall panel in a substantially perpendicular arrangement.

35. A method as claimed in claim 34 wherein there further comprises a first web panel connecting the securing panel to the first side wall panel and/or the cover panel and further comprises the step prior to step (ii) of folding the first web panel to be placed intermediate the securing panel and part of the first side wall panel.

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36. A method as claimed in claim 34 or claim 35 wherein there further comprises an internal flange hingedly connected to the first end wall and a second web panel connecting the internal flange to the securing panel, which method further comprises the step of folding the internal flange and second web panel inwardly so that the second web panel is placed in face contacting arrangement with the securing panel thereby to retain the internal flange in a substantially horizontal folded position.

5 37. A blank for forming a carton as claimed in any of claims 1 to 25.

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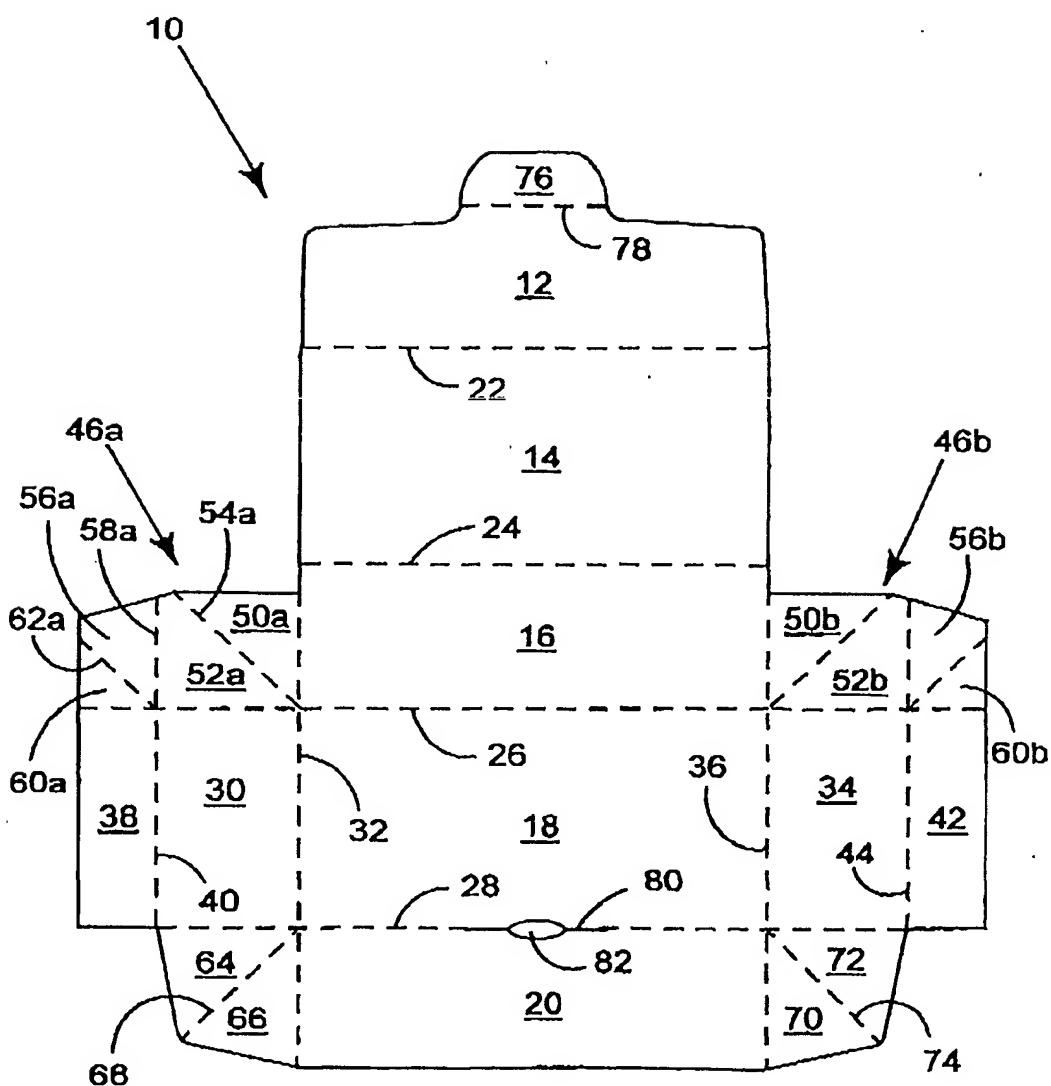


FIGURE 1

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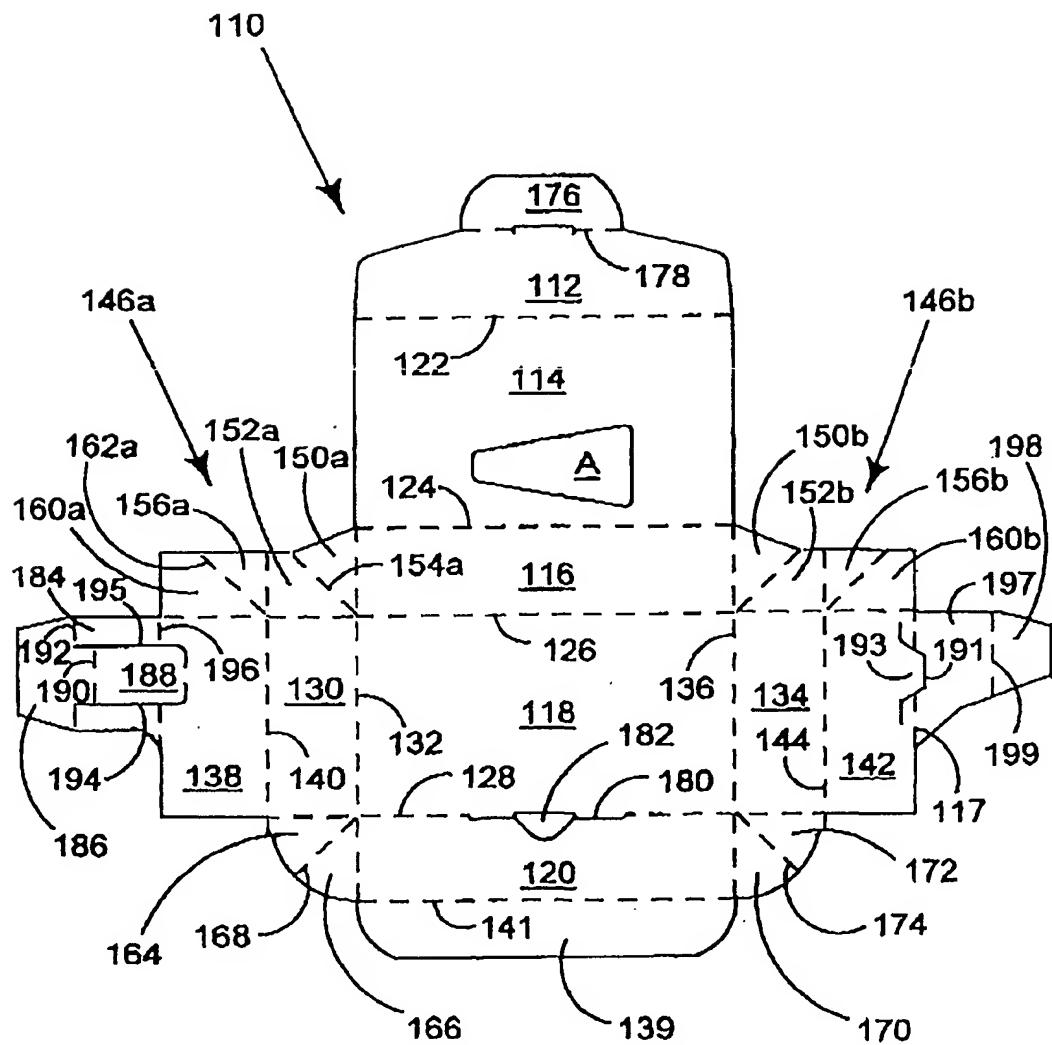


FIGURE 2

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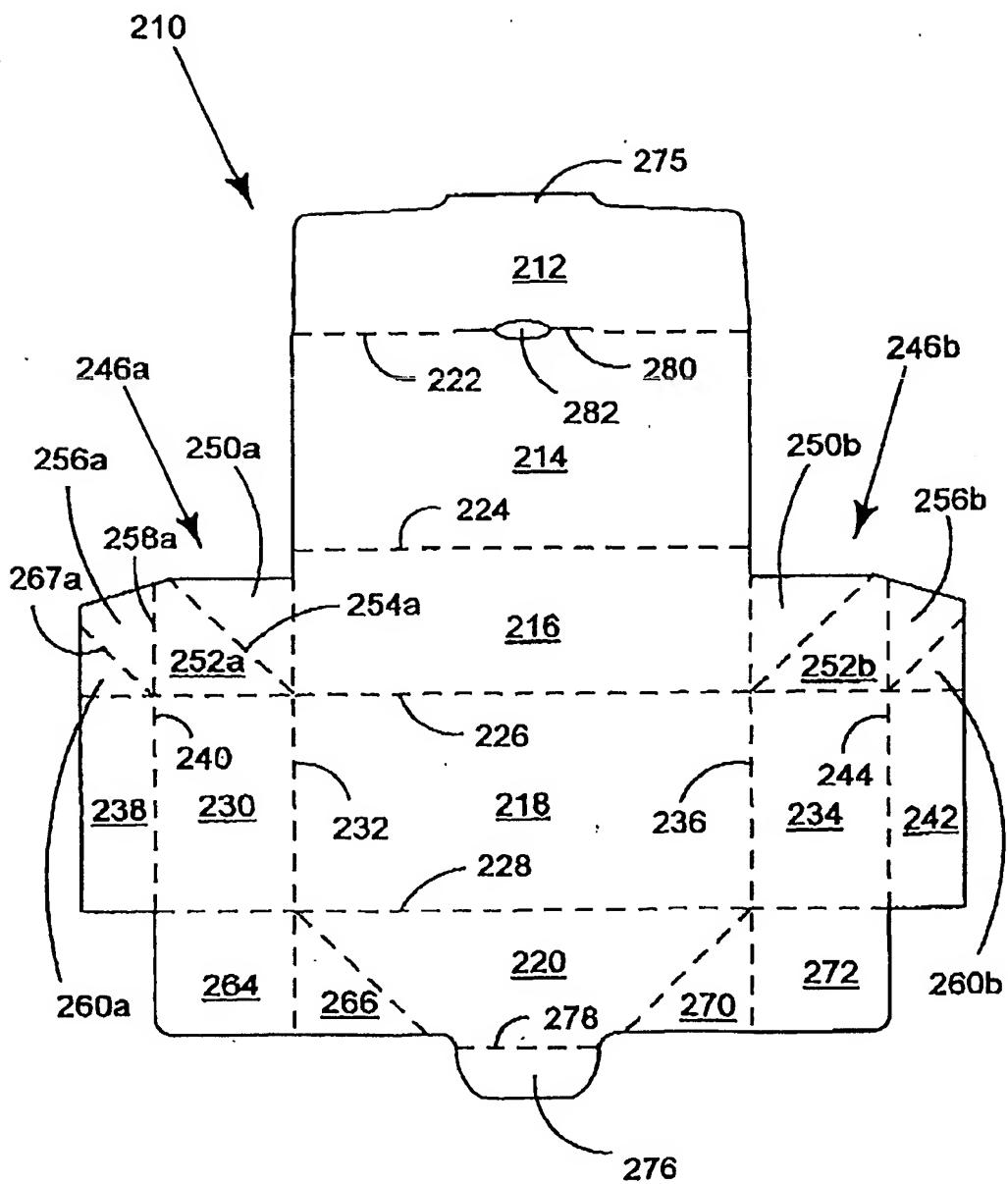


FIGURE 3

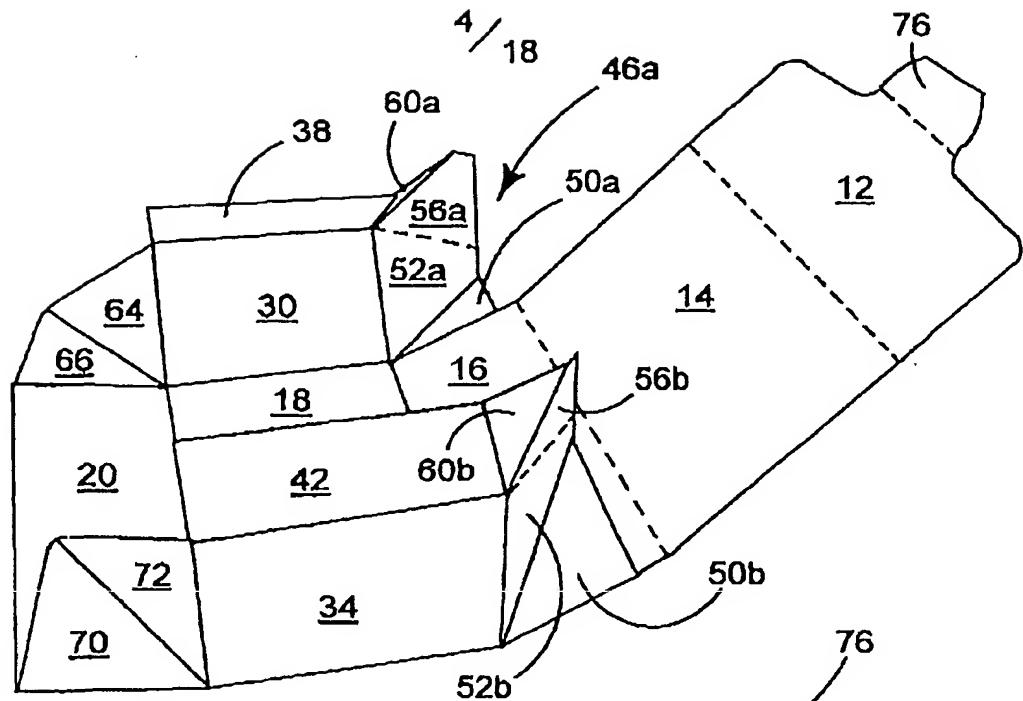


FIGURE 4

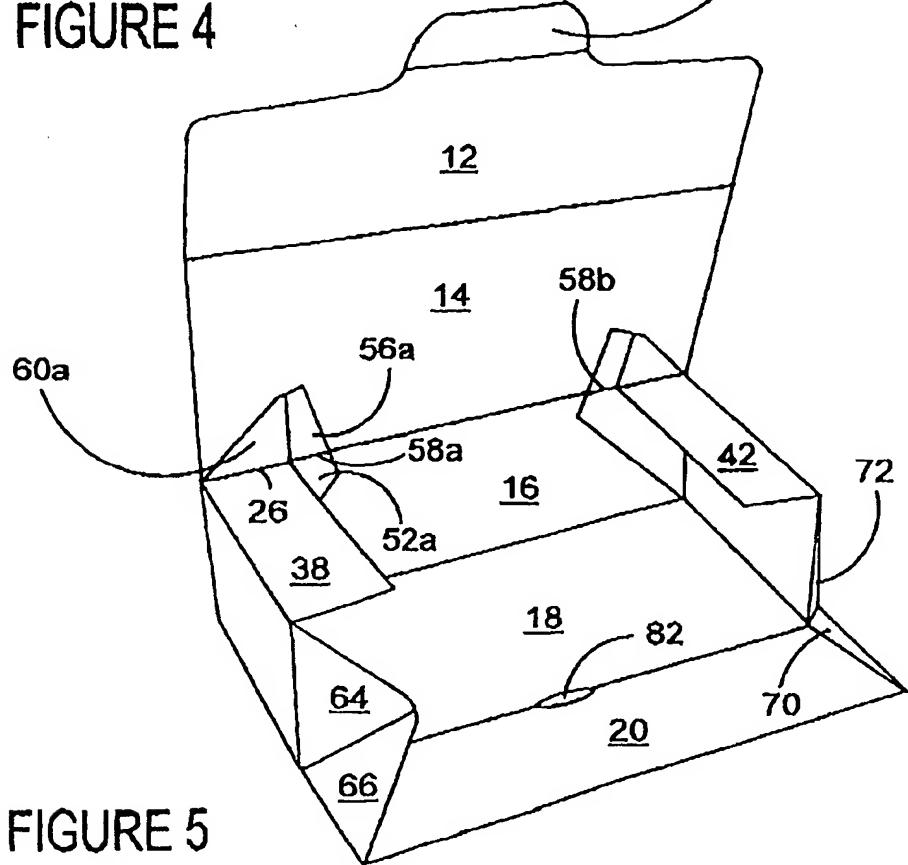
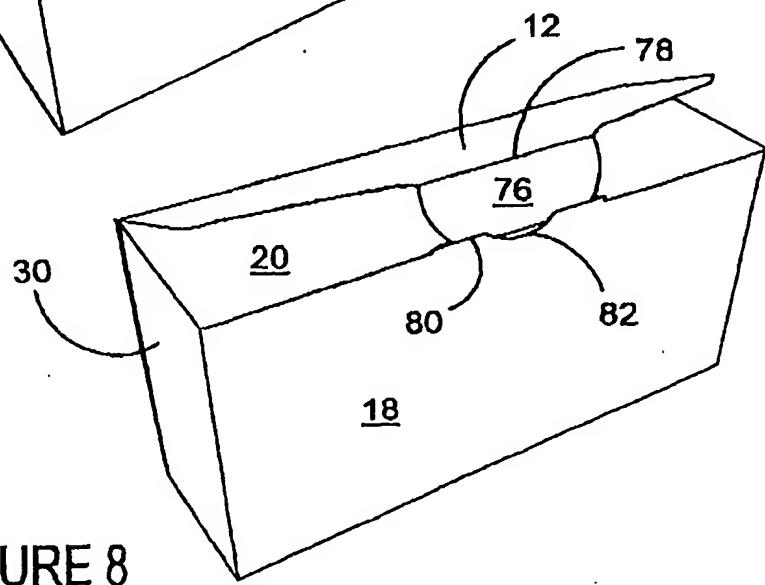
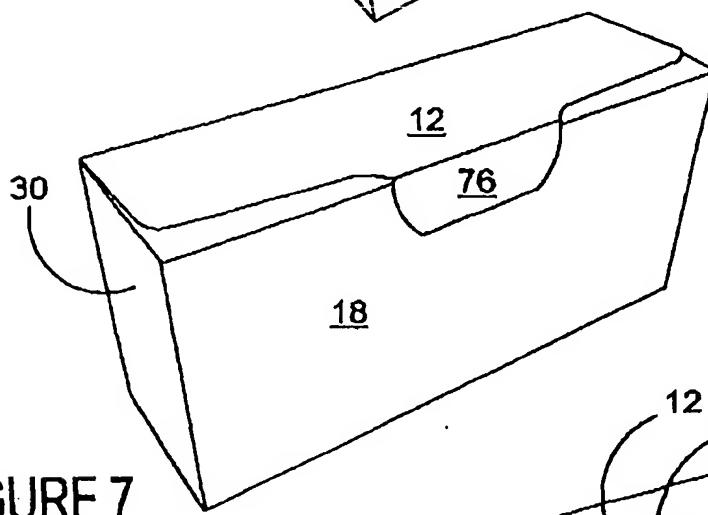
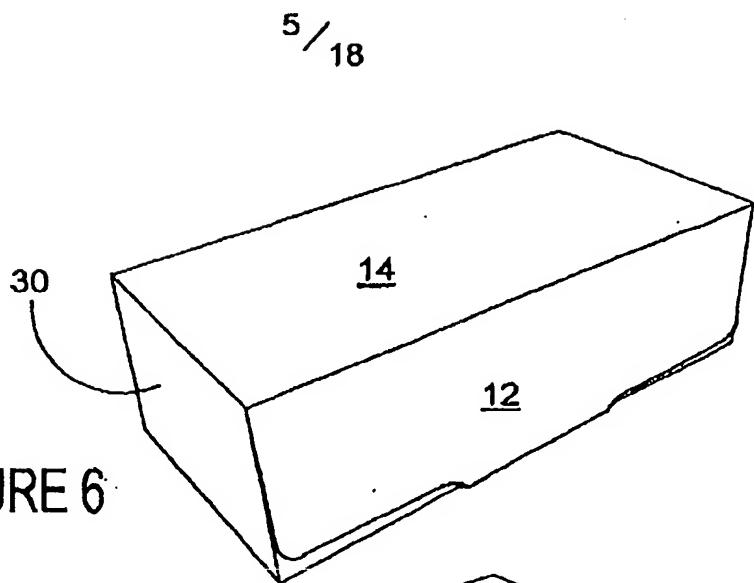
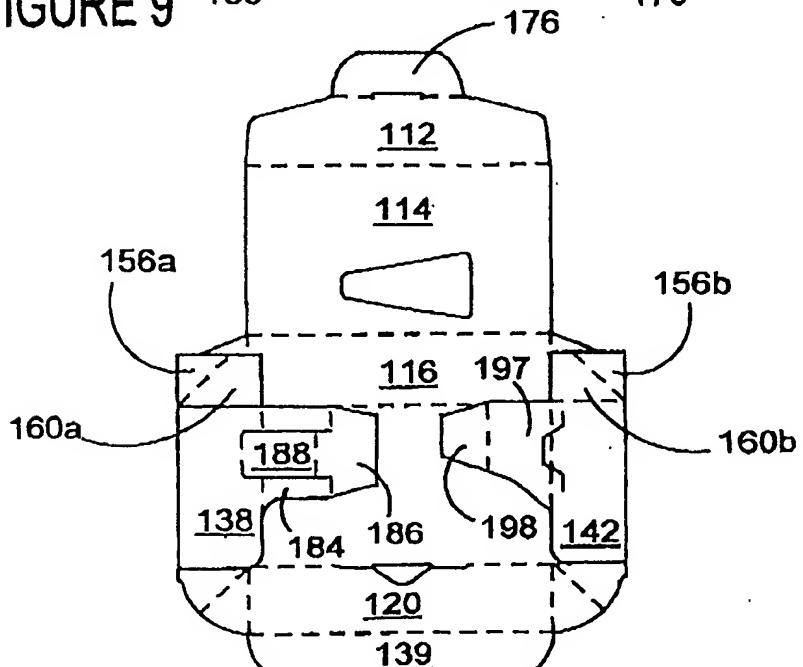
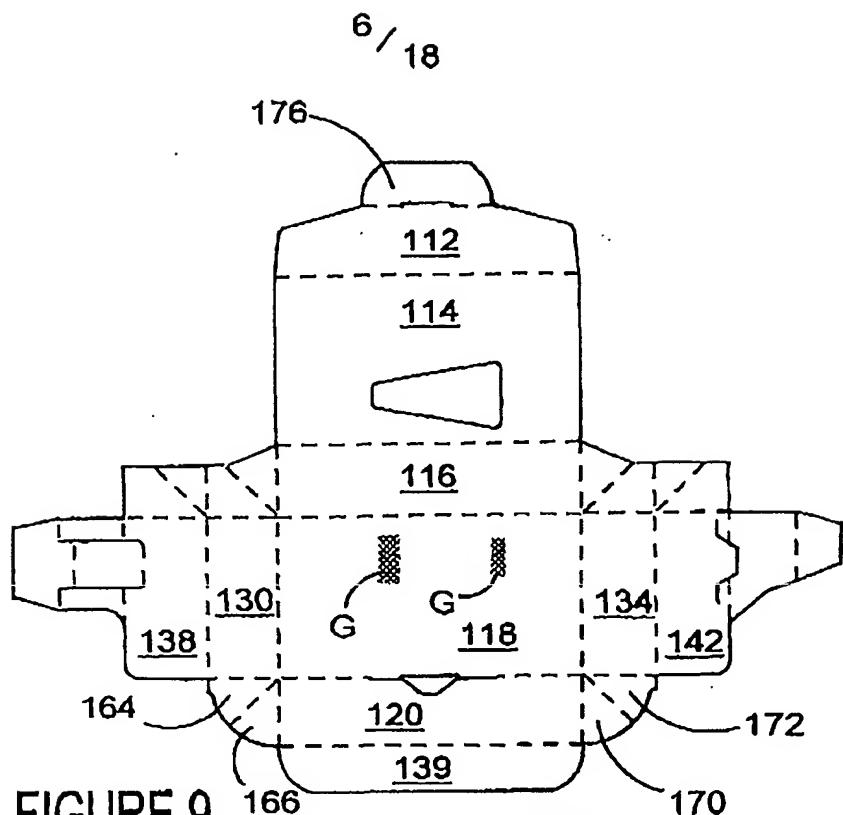


FIGURE 5





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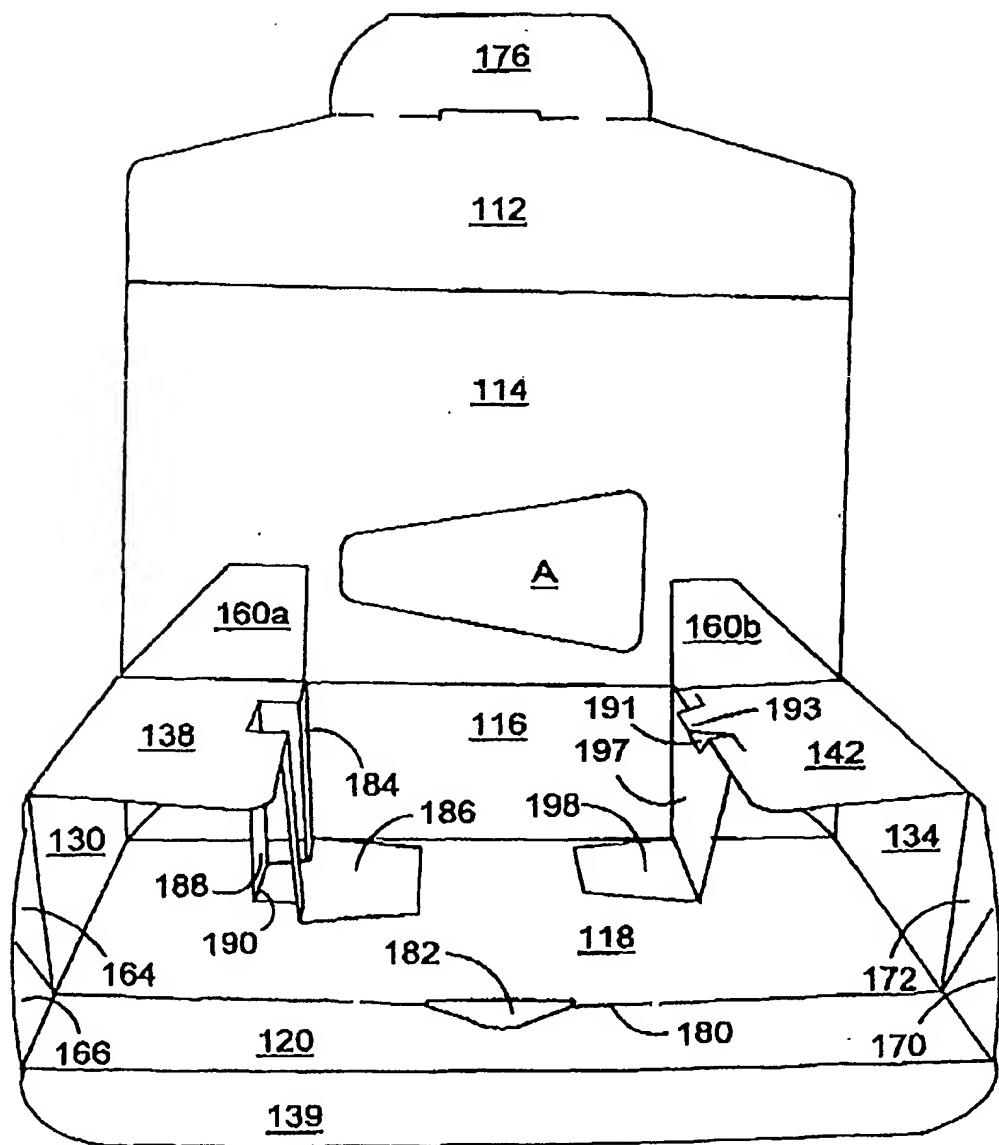


FIGURE 11

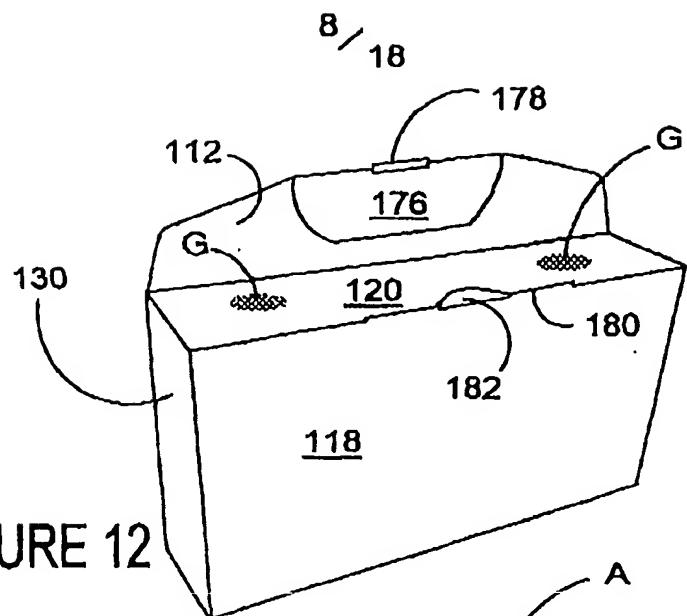


FIGURE 12

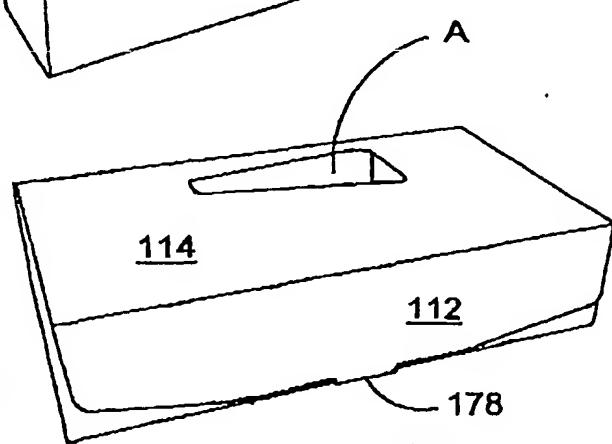


FIGURE 13

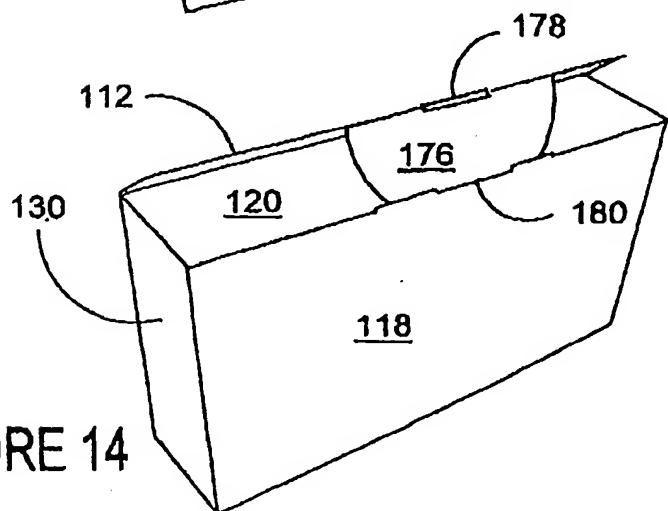
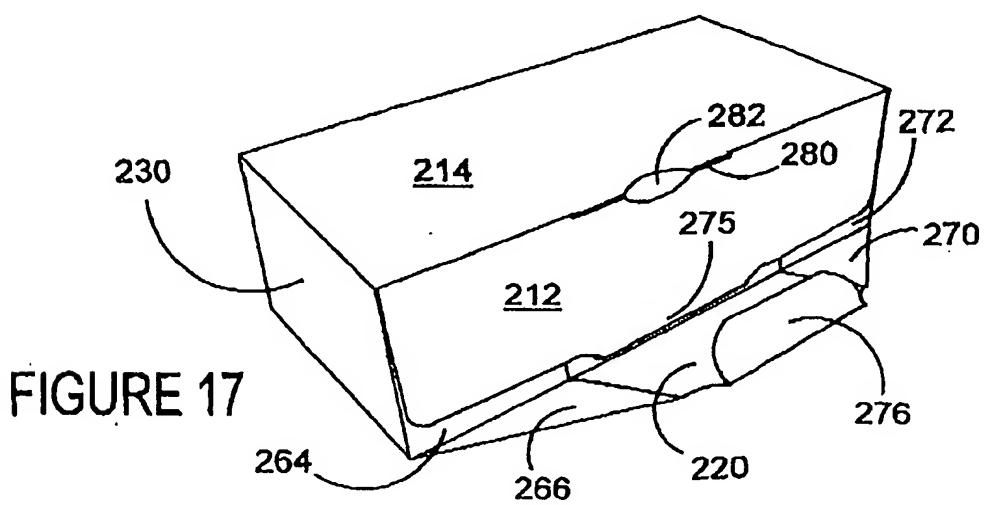
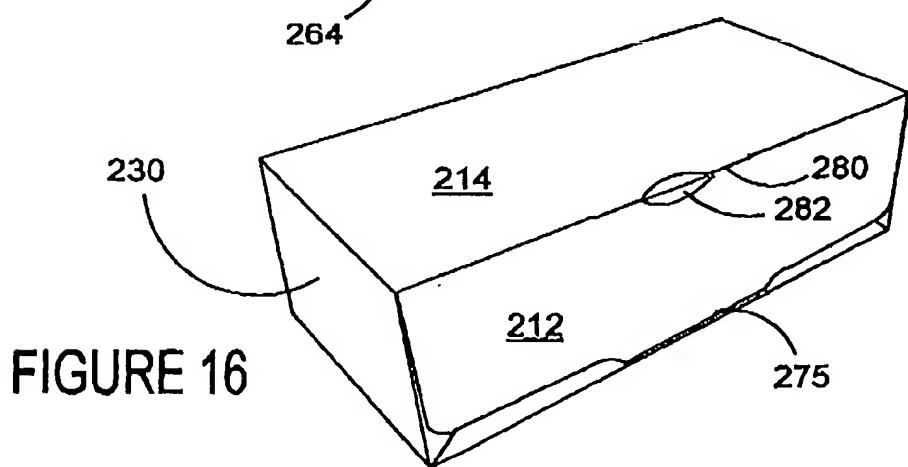
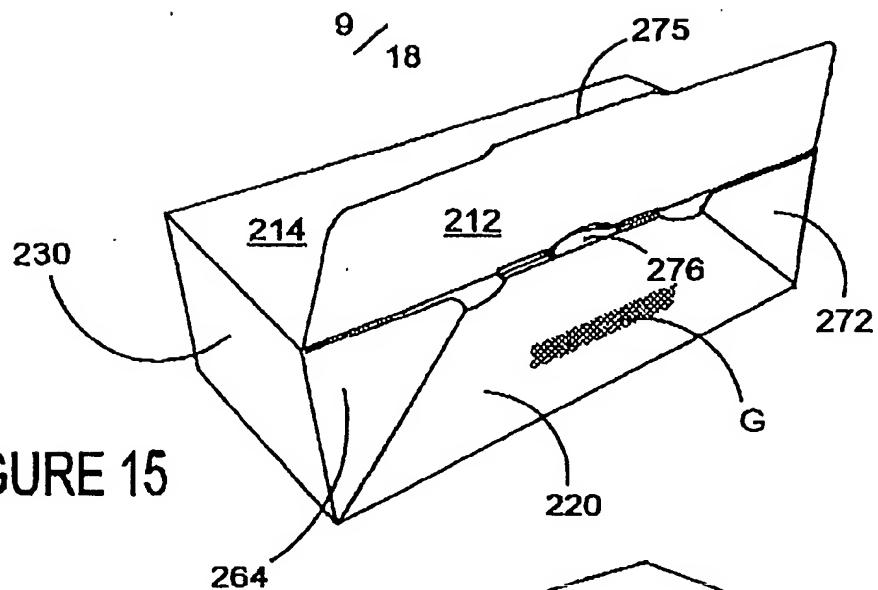


FIGURE 14



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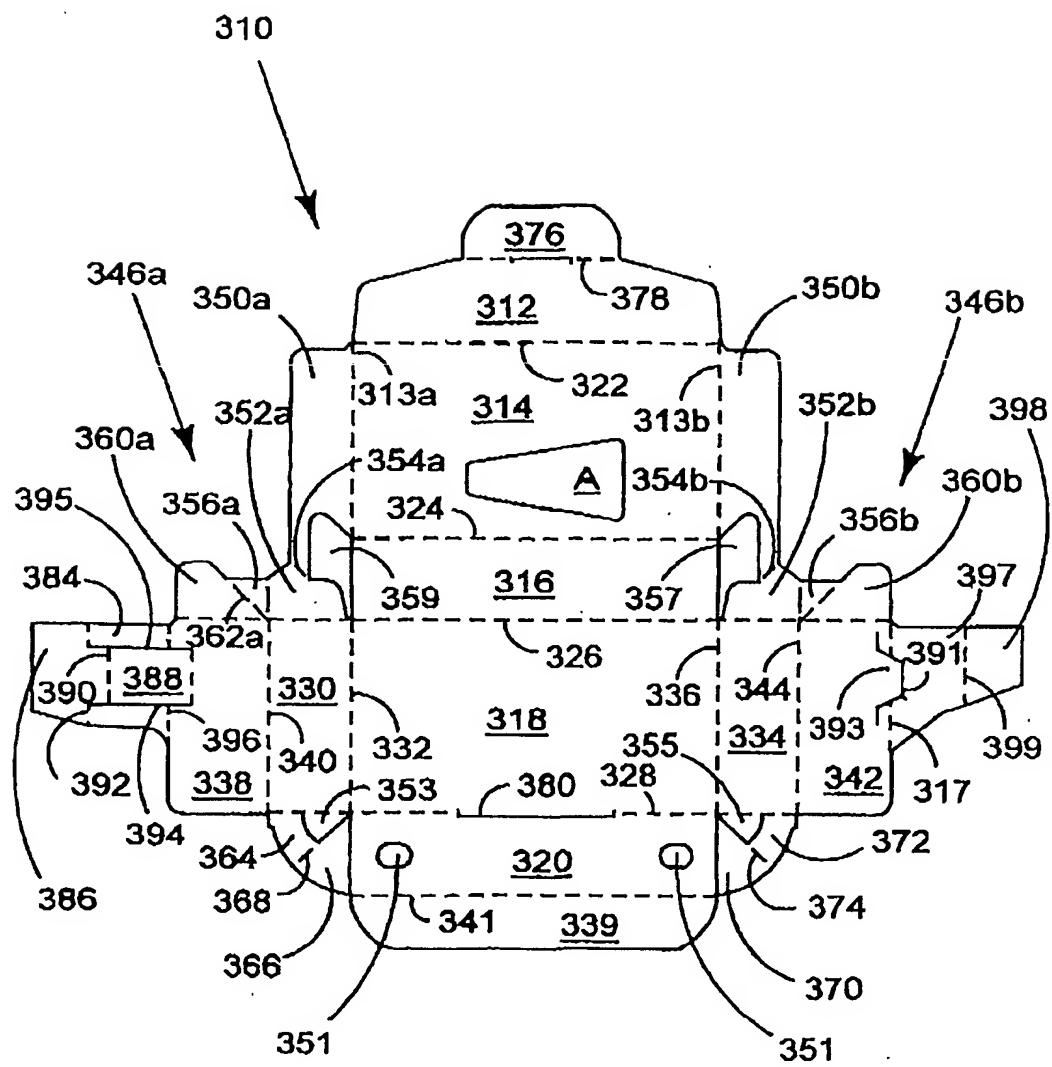


FIGURE 18

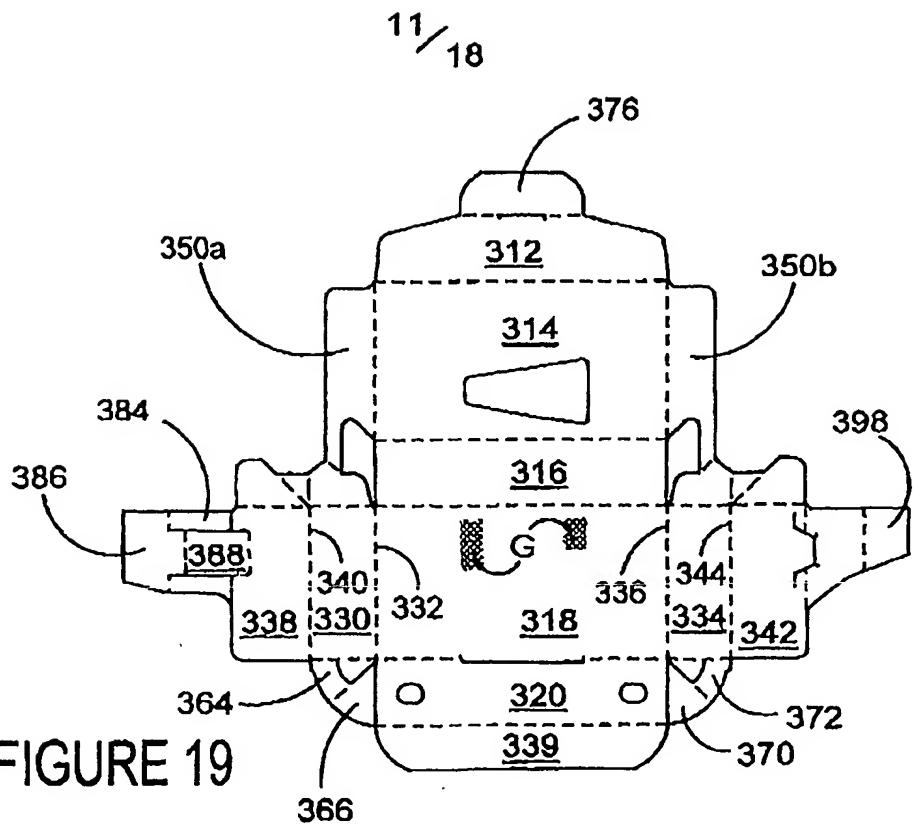


FIGURE 19

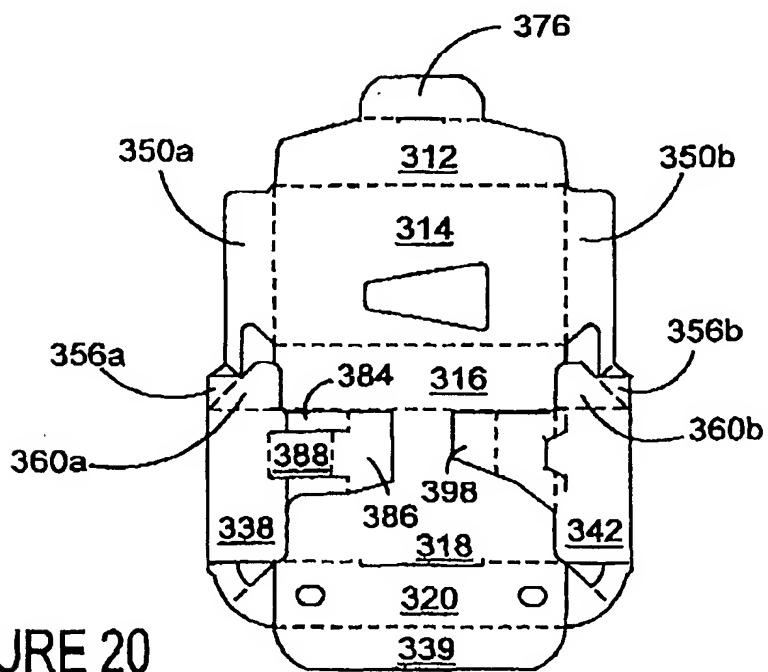
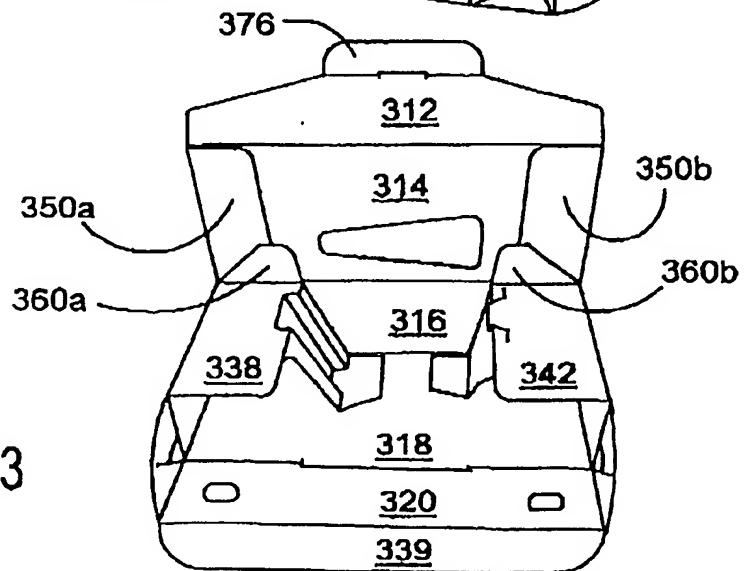
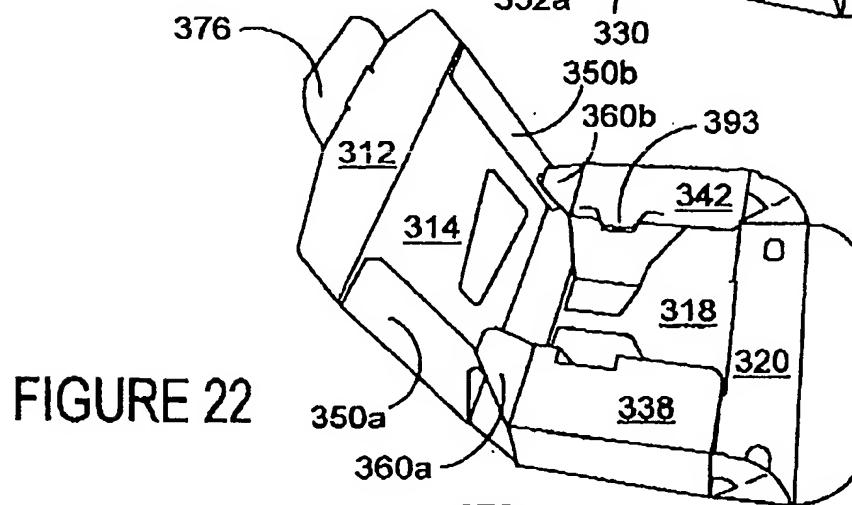
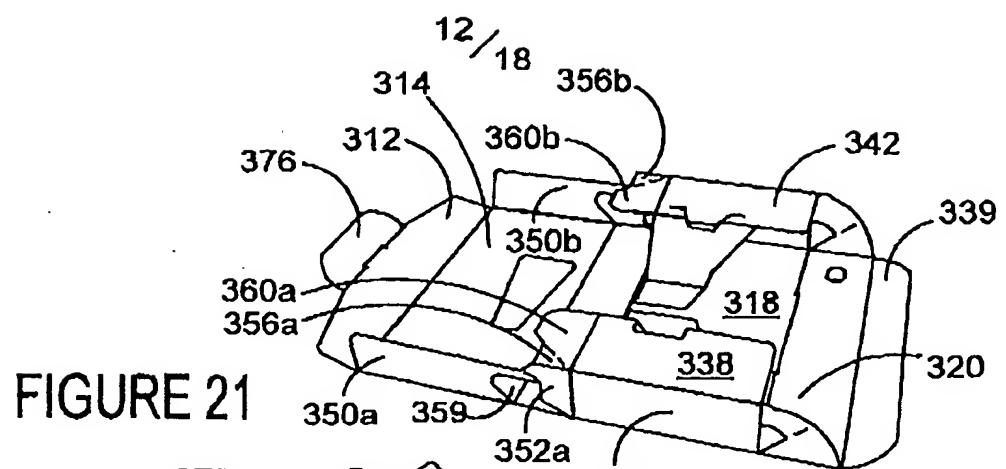


FIGURE 20



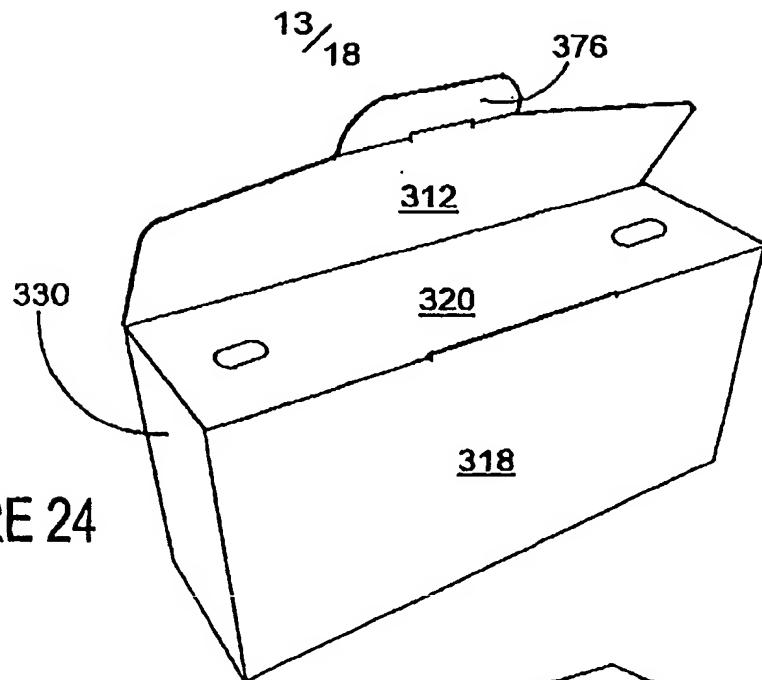


FIGURE 24

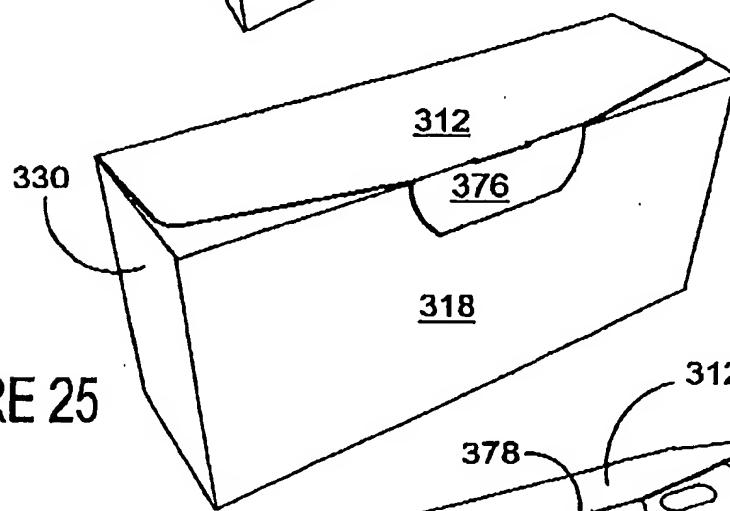


FIGURE 25

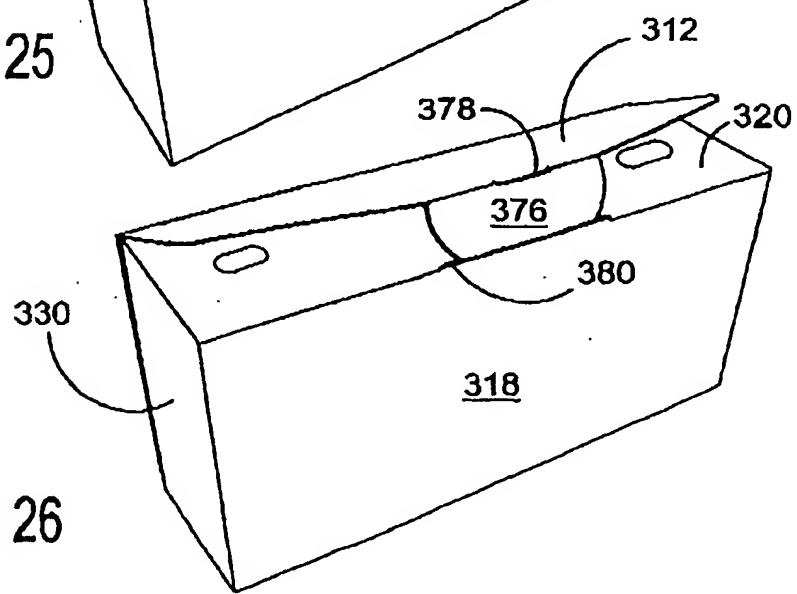
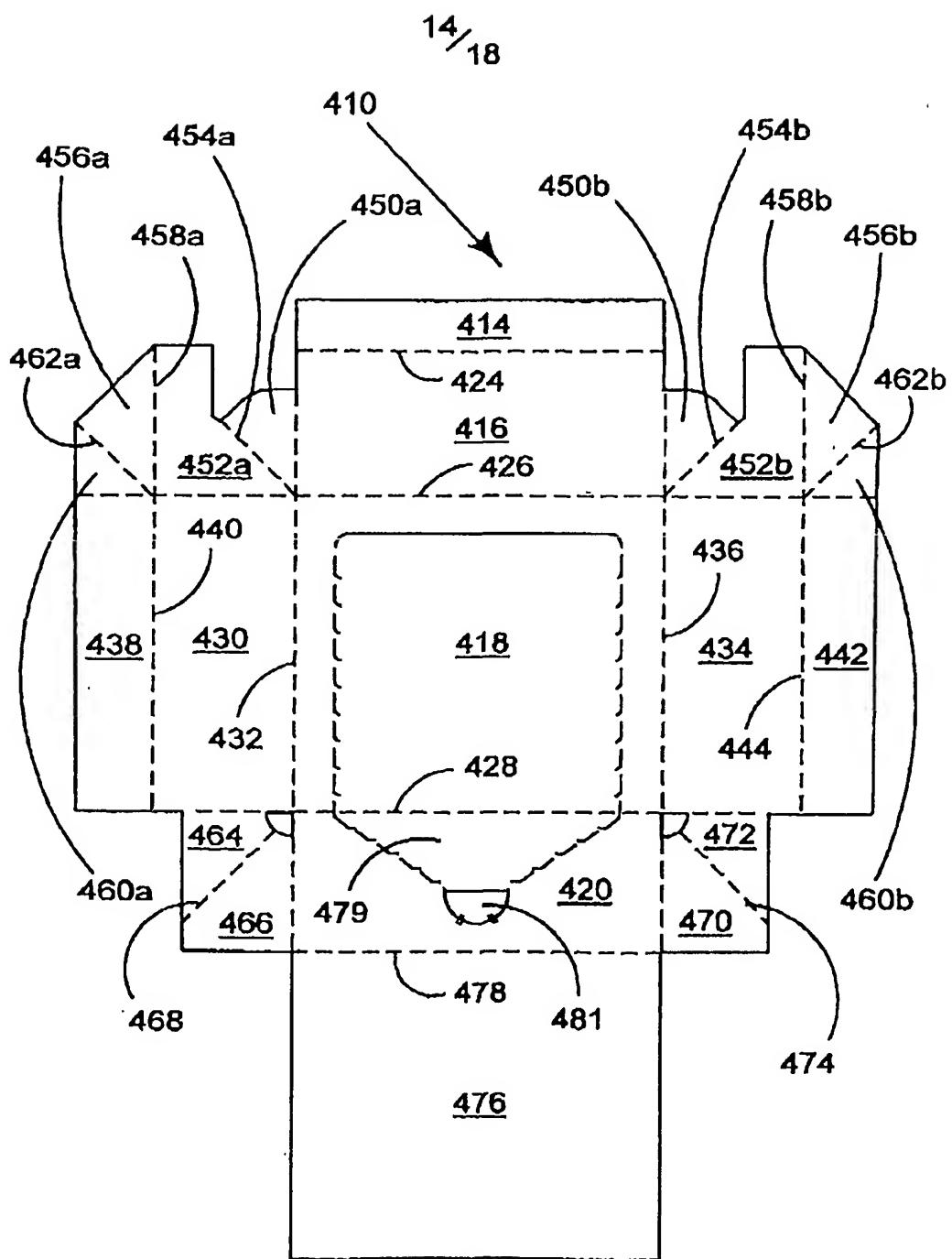


FIGURE 26

**FIGURE 27**

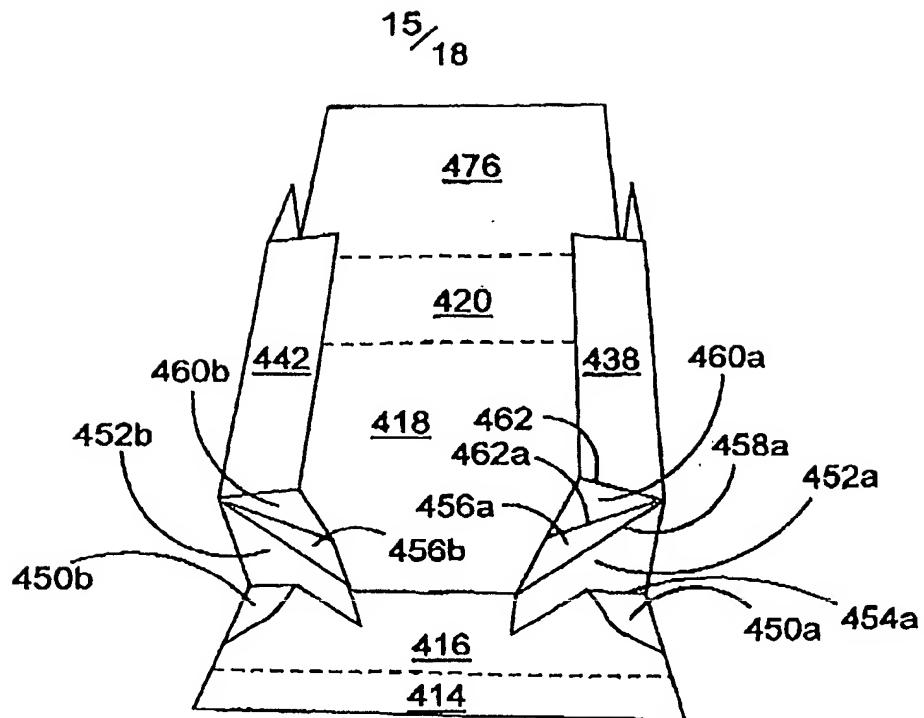


FIGURE 28

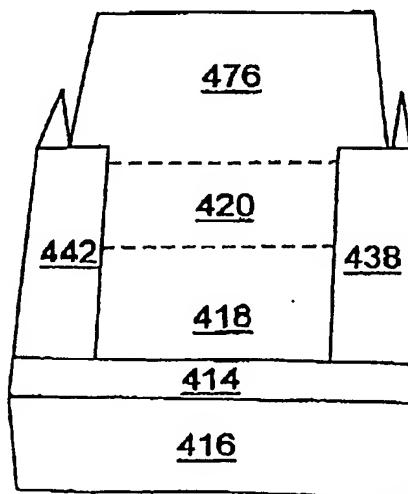
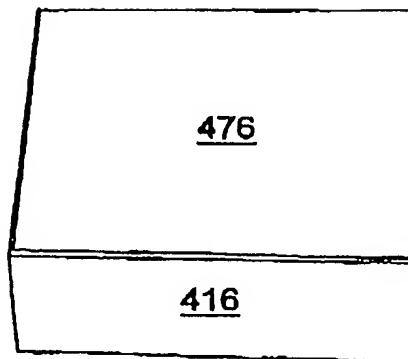
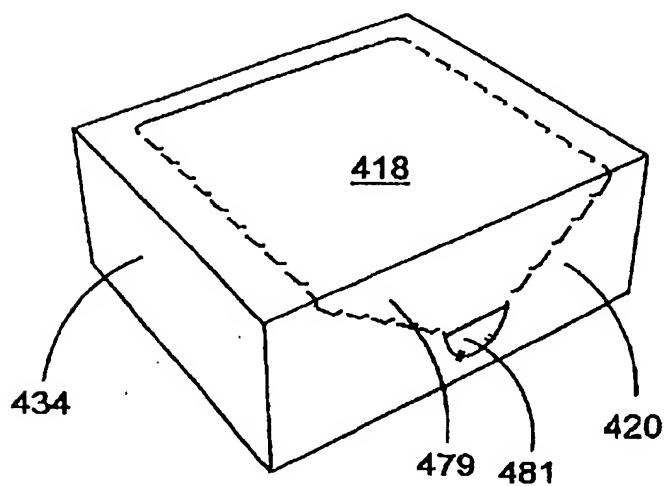


FIGURE 29

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**FIGURE 30****FIGURE 31**

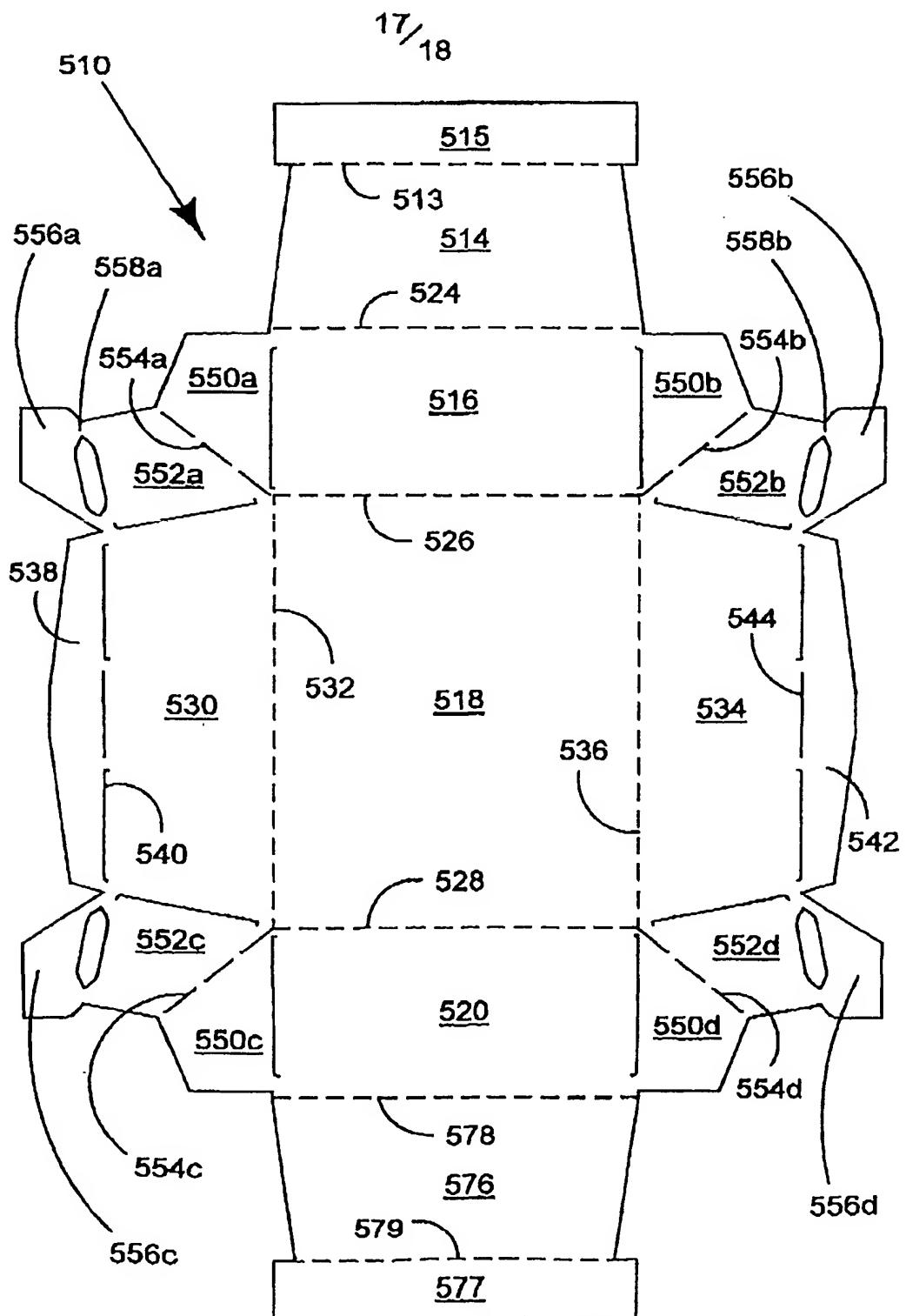
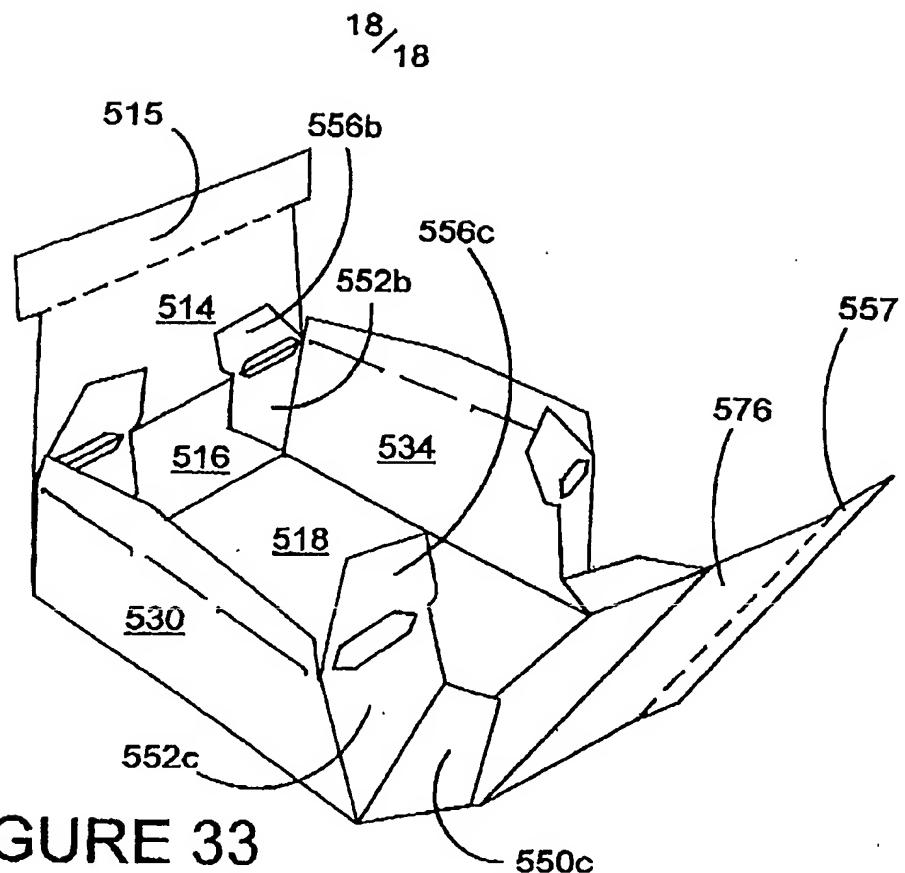
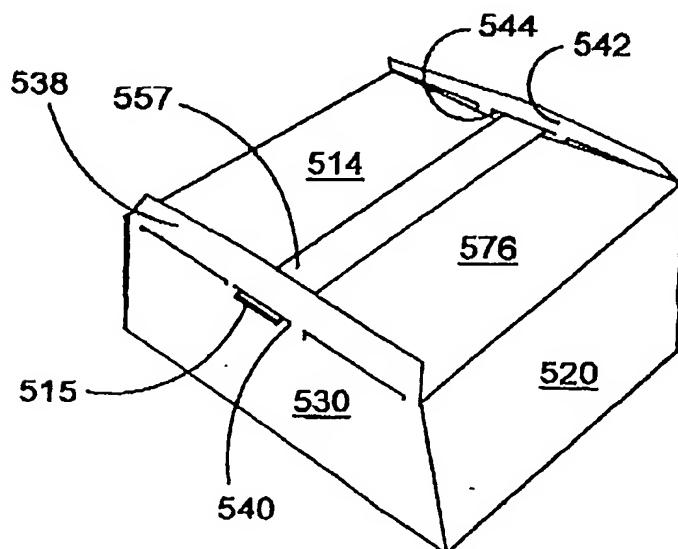


FIGURE 32

**FIGURE 33****FIGURE 34**